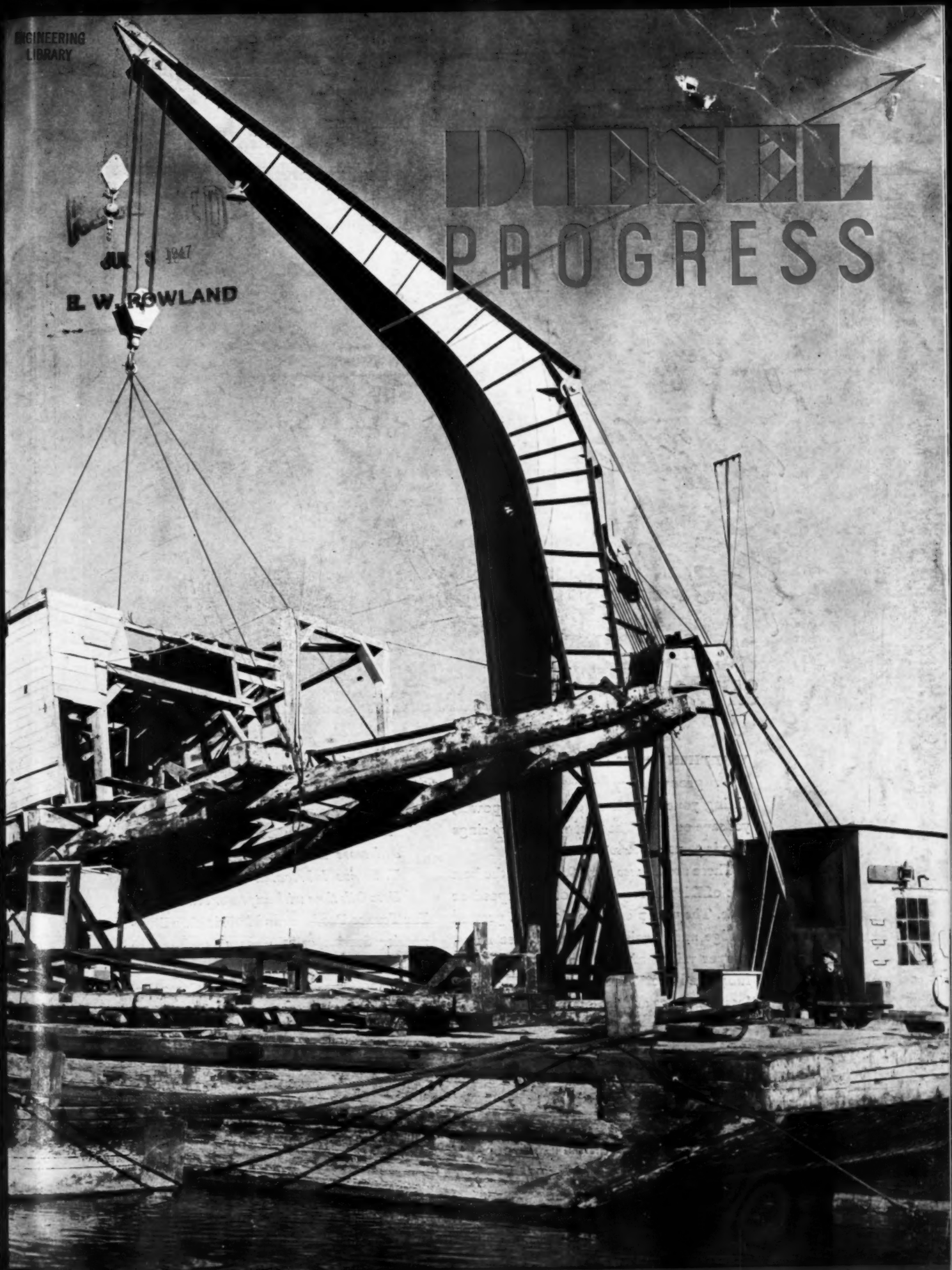
DIESEL PROGRESS



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JULY, 1947

FIFTY CENTS PER COPY

DIESEL PROGRESS, for July, 1947. Volume XIII, Number 7. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 2 W. Forty-fifth St., New York 19, N. Y. Rex W. Wadman, President. Acceptance under the Act of June 5, 1934, at East Stroudsburg, Pa., authorized Mar. 27, 1940. Subscription rates: $5 per year, single copy 50c.

DIESEL and GAS ENGINE PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

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JULY 1947

FRONT COVER ILLUSTRATION: 30-ton whirley derrick, powered by a "Caterpillar" Diesel, moves sills and engine of pile driver from one barge to another at the Richmond Yard, Richmond, California.

DIESEL PROGRESS for July, 1947, Vol. XIII, No. 7. Published monthly by Diesel Engines, Inc., 2 West 45th Street, New York 19, N. Y. Tel. MUrray-Hill 2-7333. Subscription rates are $5.00 for U.S.A. and possessions. All other countries $7.50 per year. Subscriptions may be paid the London office at £1-17s per year.

BUSINESS OFFICES	NEW YORK 19:	CHICAGO 1:	LONDON S. W. 1:
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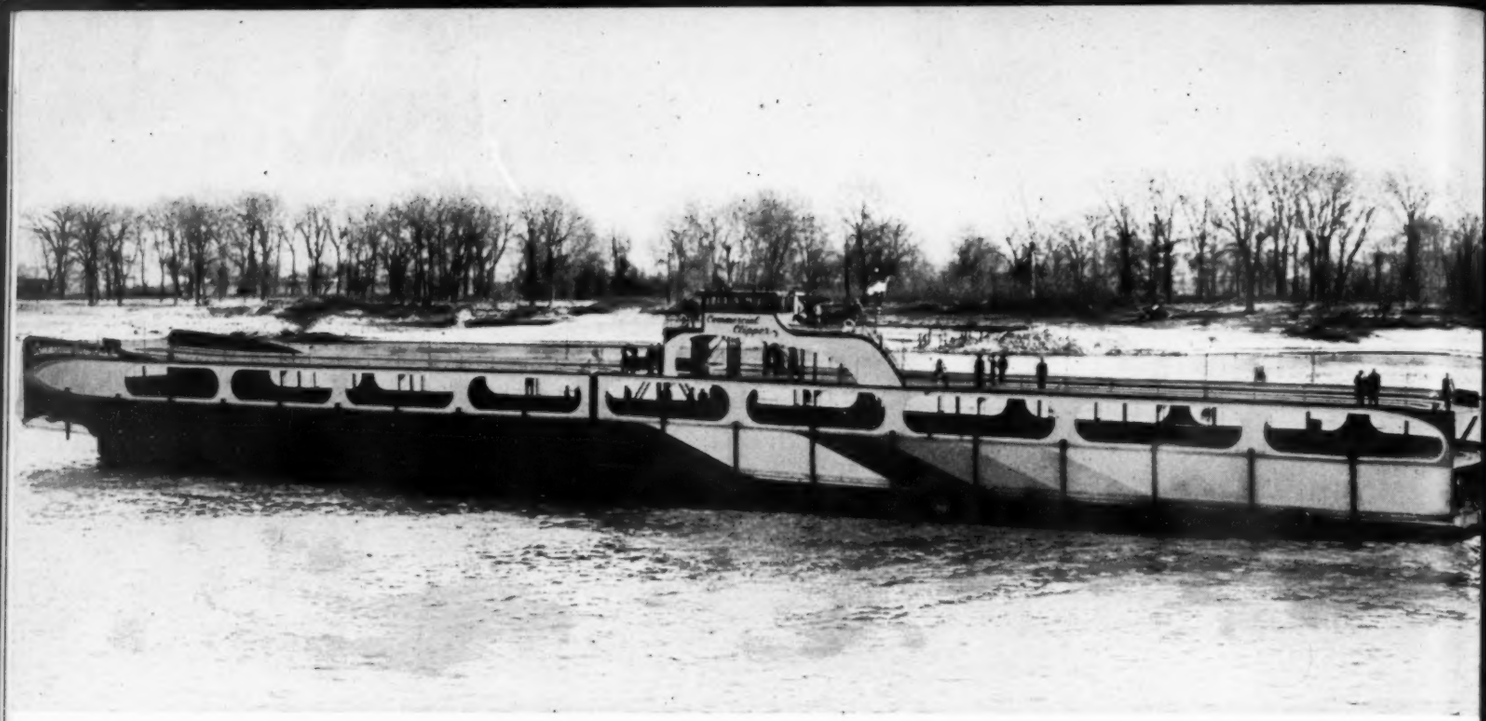
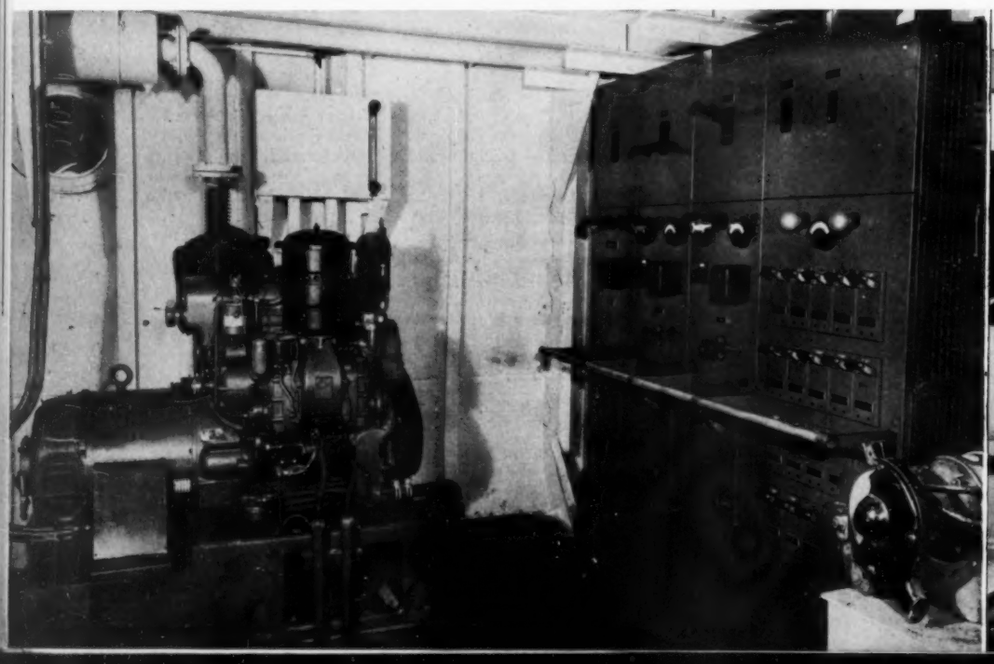


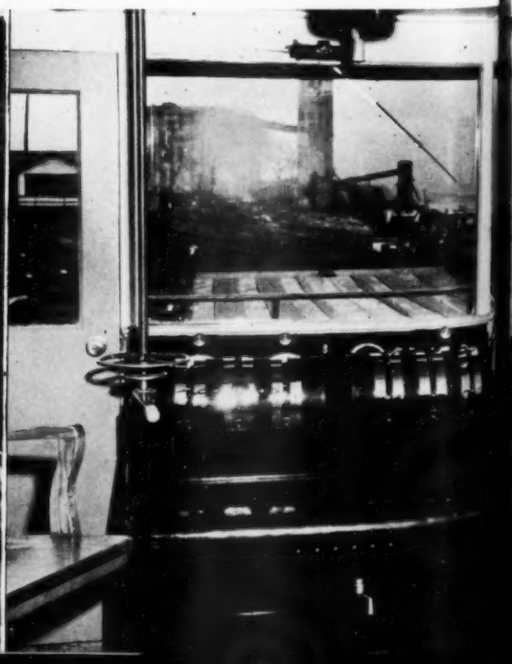
The "Commercial Clipper" operating with two of its three units during trial runs on the Mississippi. She is powered by 3 Diesel Quad units developing 660 bhp. each.

MANY "FIRSTS" ON NEW CARGO CARRIER

One of the three 30 kw. Gneral Motors Diesel generators which supply auxiliary power.



Bridge of "Commercial Clipper" show



el controls

A REVOLUTIONARY step in the design and motivation of river craft has been taken with the construction of two 525 foot all steel streamlined automobile carrying vessels by the St. Louis Shipbuilding and Steel Company for Commercial Barge Lines, Inc., of Detroit, Michigan. Designed by top ranking naval architects and marine engineers, these modern vessels are the first river craft to incorporate many commercial adaptations of propulsion principles developed and tested under battle conditions during World War II. Multiple high speed Diesel engine units driving controllable pitch propellers provide power and maneuverability hitherto unknown to inland waterway cargo vessels. These propellers were originally engineered by General Motors to meet the Navy's important landing craft and sub-chaser requirements.

Christened the *Commercial Clipper* and *Commercial Express,* immediate use of the trim sister craft will be to make scheduled runs between automobile assembly plants at Evansville, Indiana, and connecting highway transportation lines at Guntersville, Alabama, a distance of some 500 miles. Each of the 525 foot vessels consists of three separate 175 foot units tightly joined by cable and ratchets. When integrated, the fine lines of the hull are carried throughout the entire length without sacrificing speed or efficiency. The bow and center units are made up of four cargo carrying levels, all of which may be loaded or unloaded from either end by the use of adjustable ramps. The stern section is the power unit, with an elevated pilot house located on the port side. Generous crew accommodations, propulsion engines, maintenance machinery, and fuel bunkers are all located in the hull of this unit. In addition, three levels of storage area are available for cargo. In operation, the vessels may be made up of either two or three units, depending upon load requirements. Three integrated units can accommodate 600 automobiles and 498 long tons of freight. Fully loaded, each unit displaces 2483.5 tons of fresh water to a 5½ foot draft. Beam at the water line measures 35 feet and 45 feet on deck.

Propulsion power for both the *Commercial Clipper* and the *Commercial Express* is supplied by three General Motors Diesel Quad multiple engine units, each of which is rated at 660 bhp. at 1850 rpm. A quad unit consists of four basic 6-cylinder engines mounted together and driving a single propeller shaft through a 4.4:1 reduction gear. Each has its own Maxim silencer. Correct engine water temperature is maintained through Ross separate closed cooling systems for individual quads, each system having its own shell and tube heat exchanger.

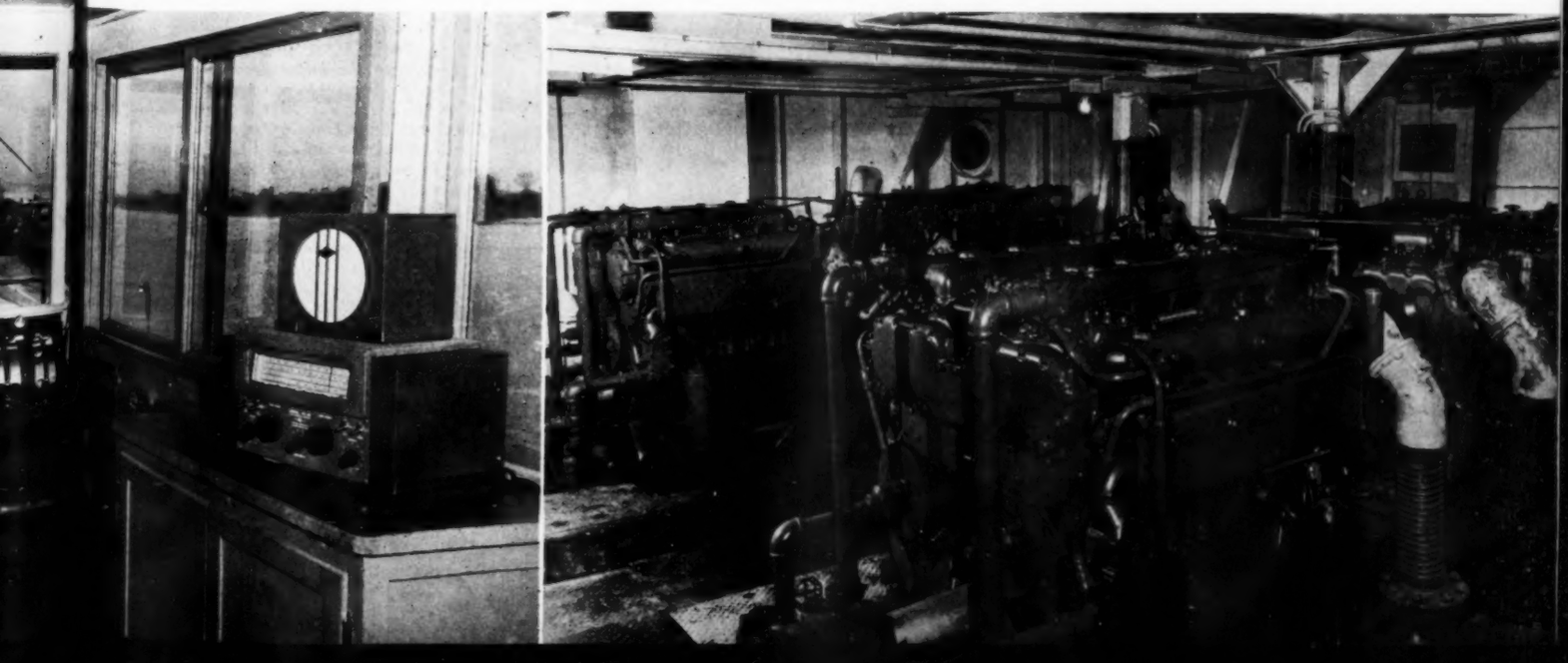
Basic engines have individual clutch and throttle controls supplied by Adel Precision Products so that under light load conditions one or more engines in a unit may be shut off for more economical operation. If necessary, basic engines could be quickly disconnected and replaced either enroute or at port during loading, thus obviating costly lay up time while repair work is being performed. Hatches directly over the engine room facilitate quick removal or exchange of any engine. Although this power plant is capable of delivering over 2000 bhp. at a governed speed of 1850 rpm., each of the three "Quad 6" units measures only 4½ feet by 10½ feet and 4½ feet high. Each of the three 60 inch controllable pitch propellers is driven at 415 rpm. by a separate quad engine unit. Since there are no reverse gears, backing is accomplished by simply reversing the propeller pitch by means of a Adel hydraulic mechanism. Engines need not be throttled down when this operation is performed. The controllable pitch feature, in addition to providing the ultimate in maneuverability, allows the engines to operate at maximum efficiency at different loads and river depths.

Immediately forward of the engine room is a 35 by 20 foot compartment containing electrical apparatus and Exide batteries. Two General Motors 30 kw. generator sets operate continually while a third functions as a standby plant for emergency use. Instruments including shaft tachometers, engine oil pressure gauges, low oil pressure alarms and water temperature alarms are located here at the engineeer's control station. Propeller controls, throttles and shaft tachometers are duplicated in the pilot house. Fuel bunkers located in the bow section of the power unit have sufficient capacity to allow a full load cruising radius of 2300 miles. Each vessel is steered by two double plate streamlined rudders operated in unison by a single electro hydraulic ram. Other ultra modern and time saving devices that have been installed include an electric intercommunicating telephone system, an R.C.A. 75 watt Radiotelephone, and Bell radio telephone—ship to shore system. A CO_2 fire extinguishing system by Walter Kidde is installed. Improved loading techniques, many of which were the outgrowth of wartime experience in moving hundreds of thousands of motor vehicles to military installations and southern ports, have been adopted.

Vehicles are loaded from floating deck barges that are equipped with ramps, so placed as to enable simultaneous loading of all four decks. Six hundred automobiles can be placed on board in about four hours. This is in contrast to old crane loading methods which take up to twenty-four hours to load the same number.

...per" shows ...el controls and R.C.A. radio equipment.

Engine room of the "Commercial Clipper" showing 2 of the 3 General Motors Quad propulsion units, rated 660 bhp. at 1850 rpm. each.



GAS AND DIESEL ENGINES FOR RICE IRRIGATION

by B. S. NELSON*

DURING the past fifty years, rice farming on the coastal plains of Southwest Louisiana and Southeast Texas has grown to a major agricultural development. It requires about 800,000 gallons of water per acre a season of approximately 100 days, or 10 GPM per acre to grow a rice crop, and many large pumping plants have been installed to pump water from the fresh water coastal streams. are common, and there are several 60" and at least one 80" unit in use.

The value of the annual crop produced is much more than the cost of the pumping equipment, so dependability is a first requisite, as a breakdown would result in serious loss from crop damage. Some of the rice irrigation companies have been in successful operation for nearly fifty years, and it is possible to trace the development of prime movers by noting the pumping equipment acquired over that period.

A typical irrigation system consists of a pumping plant located on a natural fresh water bayou or river which pumps water into an artificial canal system with distribution canals, gates, etc., enabling the watering of several thousand acres of rice. The watering is sometimes done on a per acre water charge to individual land owners, in other cases on a share crop system, and still in other cases, the Canal Company owns and irrigates its own land. In the course of time numerous canal systems have been merged under single management, as is the case in the system we are about to describe.

In 1882, Mr. H. G. Chalkley, representing English capital, came to Lake Charles, Louisiana to make substantial investments, with the idea of specializing in timber and farm land. He was so impressed by the possibilities of the coastal plains as representative farm land, that a major investment was made of such land around Lake Charles, Louisiana.

He returned to England shortly thereafter, and in 1893 his son, Mr. H. G. Chalkley, an English engineer, came to Lake Charles

* *Chief engineer, A. M. Lockett & Company, Limited, New Orleans, La.*

HENRY GEORGE CHALKLEY *(seen lower left) born in Tottenham, England, on February 11th, 1871. Attended secondary school at Bootham School, York, England, and was graduated from Leeds University at Leeds, England, as a Mechanical Engineer and served his apprenticeship at John Fowler's Steam Plow Works, at Leeds, England. He came to Lake Charles, Louisiana, from England in 1893 and worked for the St. Louis, Watkins and Gulf Railroad Co. until 1896 at which time he became assistant manager and engineer for the North American Land & Timber Company, Ltd., a British corporation; in 1905 he was made manager, which position he held until 1920 when the North American Land & Timber Co., Ltd., was sold to the North American Land Co., Inc., a Louisiana Corporation which company he formed and was its President until his death. In 1923 Mr. Chalkley formed the Sweet Lake Land & Oil Company, Inc., and served as its President until his death. Mr. Chalkley was naturalized in 1909.*

Mr. Chalkley was one of the pioneers in artificial irrigation of rice and he built the first irrigation system in Southwest Louisiana at Chloe Louisiana in 1899. He was one of the men who was responsible for the growth of the rice industry in Louisiana and it was during his life and to a certain extent due to his efforts that rice production became a more or less stable industry.

Mr. Chalkley was married twice. In 1896 he married Mary Rayne Bradley who died in 1905, to which union three children were born —Henry George Chalkley, Jr., Mary Hannah Chalkley and Gertrude Anne Chalkley (Mrs. Miller A. Alexander). In 1907 he married Laura Ellen Reid, who survives him, to which union there were no children. Mr. Chalkley died April 27, 1939.

HENRY GEORGE CHALKLEY, JR. *(upper left) was born in Lake Charles, Louisiana, on February 28th, 1898. He attended elementary and High Schools in Lake Charles, and was graduated from the United States Naval Academy in 1919 with the commission of Ensign in the United States Navy. He served on board the U.S.S. Troy, U.S.S. New Jersey and U.S.S. Osborne, on the latter vessel he served as engineering officer. He resigned from active duty in the U. S. Navy in 1924 and was employed by the Sweet Lake Land & Oil Company, Inc. and the North American Land Co., Inc. as manager and engineer. In 1939 at the death of his father he became President and manager of the Sweet Lake Land & Oil Co., Inc., North American Land Co., Inc., The Lacassine Co., Inc. and the Louisiana Canal Co., Inc.*

In 1941 he was called back to active duty in the U. S. Navy as Assistant Supervisor and later Supervisor of Ship Building at Orange, Texas. In April, 1946 he was released to inactive duty with the rank of Captain and returned civilian occupation as stated above.

Mr. Chalkley was married once in 1927 to Frances O'Dell Moran. They have no children.

epresenting his father's interests, and shortly hereafter, in 1899, organized a Rice Canal ystem, known as the North American Land nd Timber Company.

His first pumping plant consisted of a steam-driven Connersville rotary pump, a number of which were in use for irrigation work, because the centrifugal pump at that time was so inefficient.

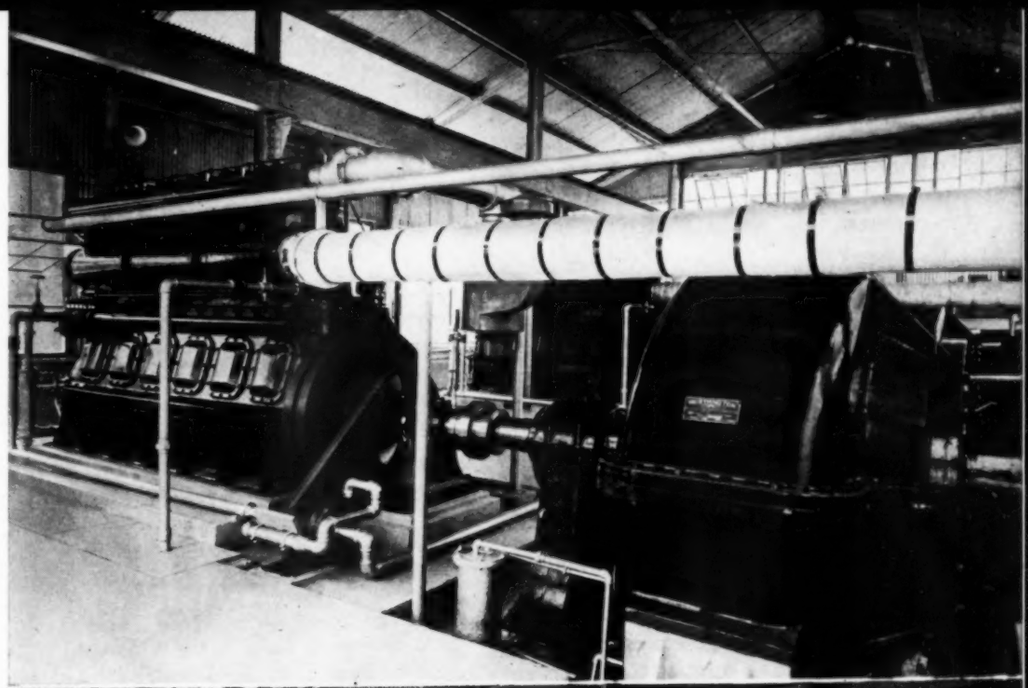
In 1899, when A. M. Lockett & Company of New Orleans was organized, Mr. Lockett realized the potential market for mechanical equipment in rice irrigation pumping plants and pioneered in the design of such plants, embodying efficient equipment.

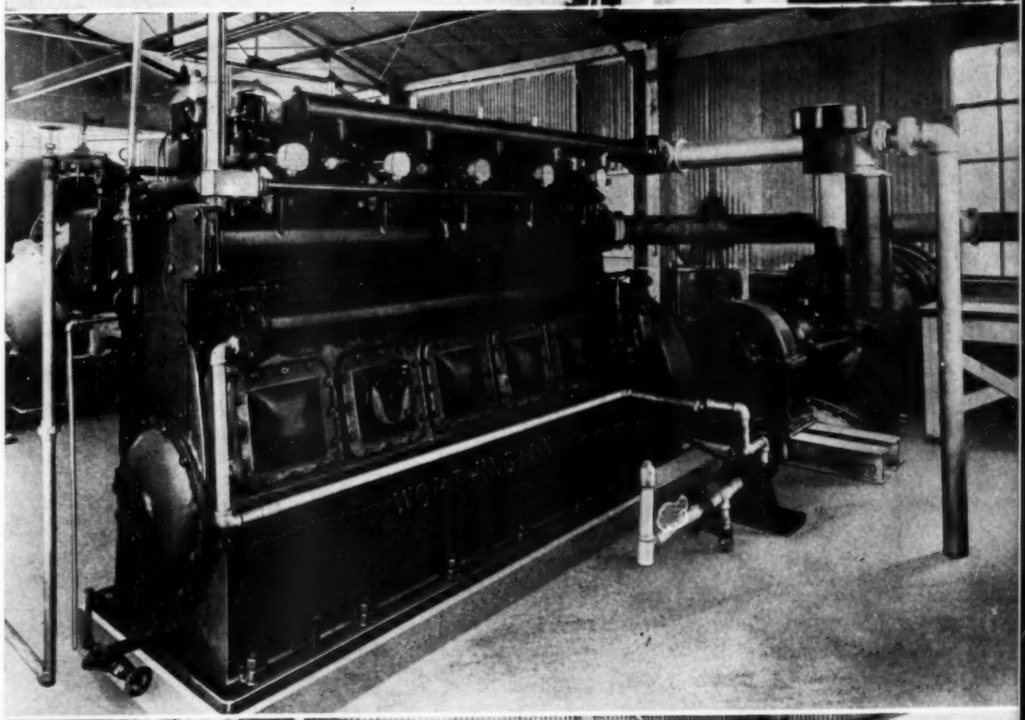
The North American Land and Timber Company, whose name was later changed to the Sweetlake Land and Oil Company, was successful from the beginning, and Mr. Chalkley gradually acquired management of several other Canal Companies which were merged with the parent company, and all of which are adjacent to Lake Charles, Louisiana.

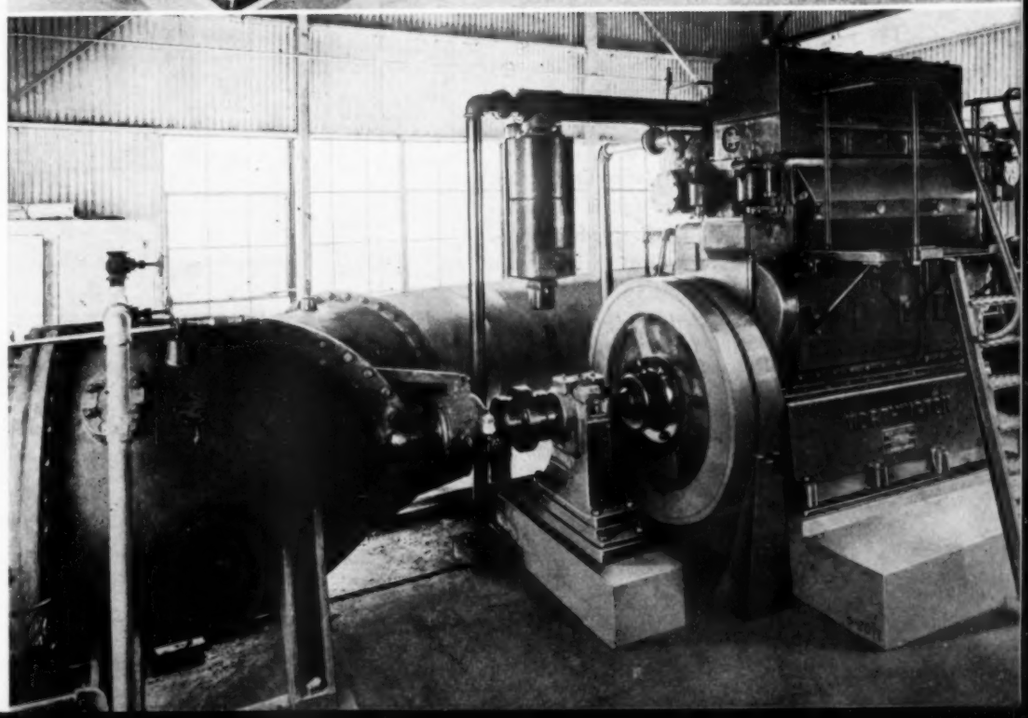
These companies are: Sweetlake Land and Oil Company; Louisiana Canal Company; Prairie Canal Company; The Lacassine Company.

Mr. H. G. Chalkley, Jr. was executive assistant to his father in the purchase, installation, management and operation of their numerous irrigation plants, and when Mr. Chalkley Sr. died in 1939, became president and general manager of the several companies above mentioned.

In 1907, Mr. Chalkley, Sr. purchased from A. M. Lockett and Company, Limited, contracting mechanical engineers of New Orleans, his first centrifugal pump which was designed and installed by Lockett. This consisted of a 60" Worthington slow speed volute pump direct connected to a cross compound Hamilton Corliss Steam Engine with Babcock and Wilcox Water Tube Boiler. This plant is still in useful service, and has operated every pumping season since installed, or forty seasons.







(Top right) Pump installation at Louisiana Canal Company—Six cylinder 400 hp. Worthington gas engine driving 42-inch Mixflo pump. Identical set up is seen in background. Picture below shows another view of pumping plant. 150 hp. Worthington Diesel connected to 42-inch Worthington propeller-type pump.

(Bottom right) Worthington 3-cylinder, 170 hp. Diesel driving 42-inch propeller pump at Sweetlake Land and Oil Company plant.

During Mr. Chalkley, Sr.'s long career, all of the equipment for his numerous plants was purchased from A. M. Lockett & Company, Limited, and was exclusively Worthington equipment, and the present management has followed this example.

We give below a list of the several canal properties of this Canal System, with the equipment therein, and it will be noted that the original plants were steam; then a semi-Diesel oil engine; then a two-cycle oil engine; then electric motor drive; then all recent plants have been gas or oil engine driven. In several cases, old steam or motor driven equipment have been converted to gas or oil engine drive.

A particularly modern plant is the one shown in the photographs and drawings. This is one of the Louisiana Canal Company's plants, and consists of two 42" Worthington Mixflo type pumps, each designed to pump 45,000 gallons per minute against 26 ft. total head with 83% efficiency at 400 rpm. This plant was installed in 1929 with synchronous motor electric drive and operated quite successfully for ten years.

During that period oil was discovered nearby and cheap gas fuel became available, so in 1930, one pump was converted to gas engine drive, and in 1940, the second pump was similarly converted. In each case, the pump was connected to a Worthington six cylinder, CG-6, 400 hp., 4 cycle gas engine.

Due to cheap fuel and efficient maintenance and performance, these gas engines have shown a substantial saving over purchased electric power.

All of the plants listed after 1924 were installed under the supervision of Mr. H. G. Chalkley, Jr., and all of the larger installations were designed by A. M. Lockett & Company, Limited.

The propeller type pumps are used for low lifts of five to eight feet, while the Mixflo type is used for higher lifts, usually twenty to twenty-five feet. Wherever possible, engines are direct connected, sometimes at the expense of derating the engines by operating at less than normal speeds; where this is impracticable, due to slow pump speed, speed reduction is gotten by using gear or silent chain drive.

Irrigation Plants of Chalkley Interests Near Lake Charles, Louisiana, and Dates Installed

North American Land & Timber Company (Now Sweetlake Land and Oil Company).

1907—one 60" Worthington slow speed centrifugal pump, with Hamilton Corliss steam engine and Babcock and Wilcox boiler—plant still in use.

1915—one 24" Worthington centrifugal pump direct connected to Worthington horizontal semi-Diesel, two cycle oil engine; in 1929 engine was replaced by 55hp. vertical trunk piston Worthington two cycle oil engine.

1918—one 30" Worthington centrifugal pump with Ideal tandem compound steam engine; in 1935 steam engine replaced by 90 hp., 3 cylinder, 4 cycle, BB-3 Worthington oil engine. (Now installed on Louisiana Canal).

Sweetlake Land & Oil Company—

1930—one 42" horizontal propeller type Worthington pump driven by rope drive from existing Corliss steam engine; at this writing, steam engine is being replaced by BBG-6, 210 hp., 6 cylinder, 4 cycle Worthington gas engine, driving pump through Morse chain drive.

1937—one 36" horizontal propeller type Worthington pump, direct connected to 170 hp., 3 cylinder, 4 cycle Worthington C-3 oil engine. (See photographs).

1941—one 30" propeller type Worthington pump direct connected to 90 hp., 3 cylinder, 4 cycle Worthington oil engine, B-3.

1946-1947—one 42" propeller type Worthington pump direct connected to 210 hp., 6 cylinder, 4 cycle, Worthington BBG-6 gas engine —this new unit now on order.

Louisiana Canal Company—

1929—two 42" Mixflo pumps direct connected to 350 hp. synchronous electric motors. (See photograph). In 1939, motor on one unit was replaced by a 6 cylinder, 4 cycle, 400 hp. Worthington CG-6 gas engine, and in 1940, the second unit was similarly connected to gas engine drive. (See photographs).

1930—one 42" propellor type Worthington pump driven through V-belt drive from 125 hp. electric motor.

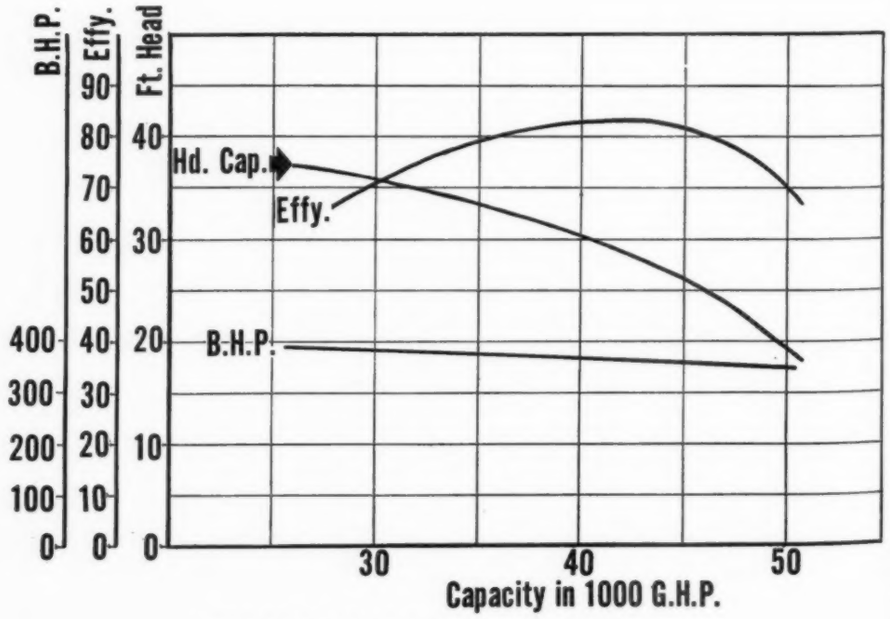
In 1936 this unit was converted to oil engine drive, using a 150 hp., 5 cylinder, 4 cycle Worthington BB-5 oil engine driving pump through Farrell Birmingham stepdown gears (See photograph).

Prairie Canal Company—

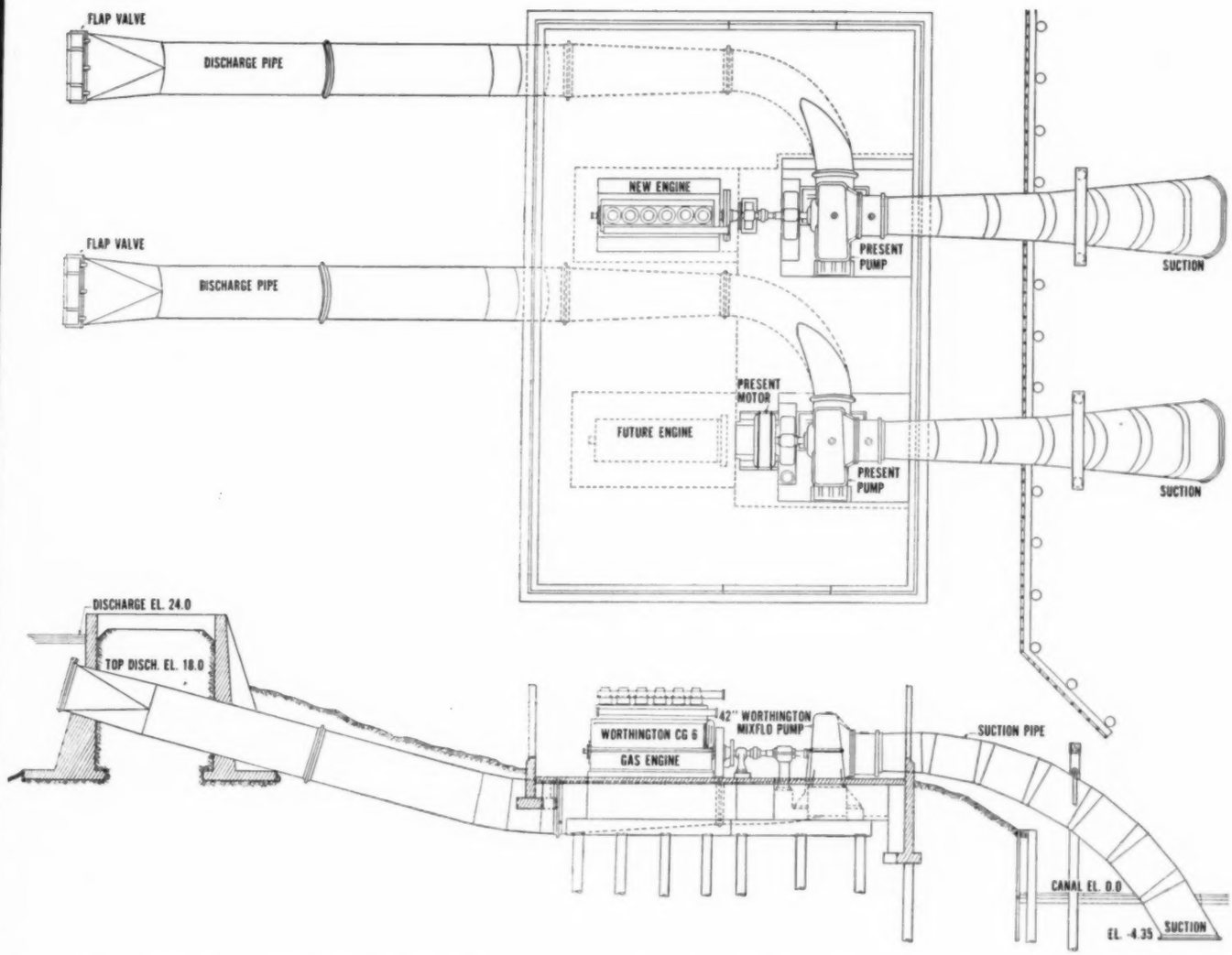
1936--one 30" Worthington Mixflo Pump and Electric Motor.

The Lacassine Company—

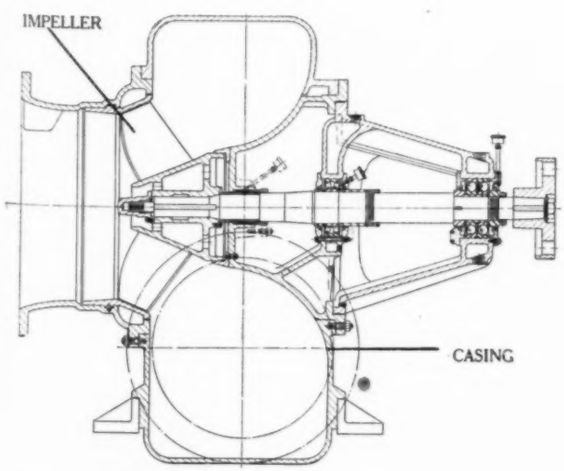
1937—one 30" Worthington propeller pump and 90 hp., 3 cylinder Worthington 4 cycle BB-3 oil engine.



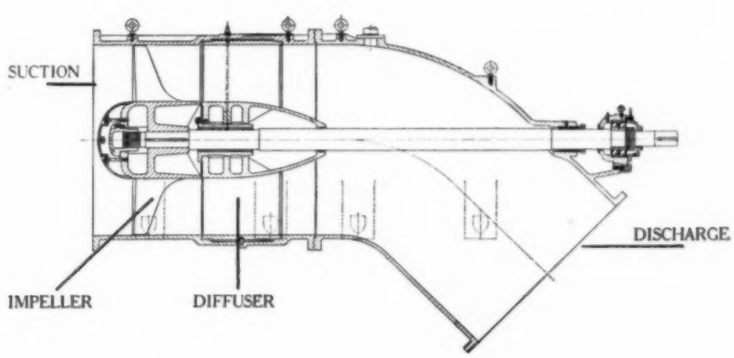
Typical Mixflo pump performance characteristic curve.



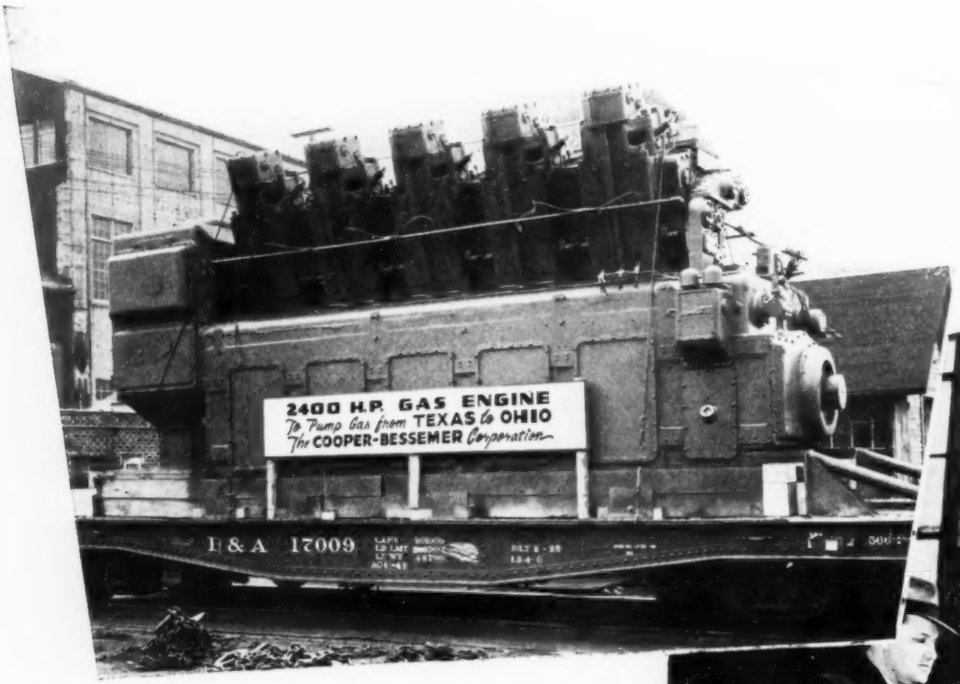
Plan and elevation drawing of general arrangement pumps at the Louisiana Canal Company plant. Two 42-inch Worthington Mixflo pumps each designed to pump 45,000 gpm. against a 26-foot total head are driven by two 400 hp. Worthington gas engines.



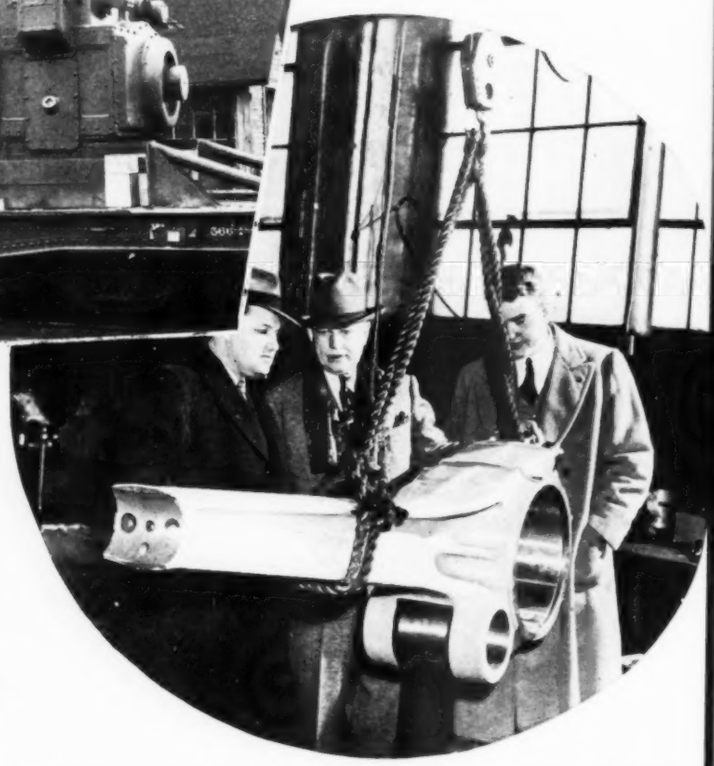
Cross section of Worthington Mixflo-type horizontal volute pump.



Cross section of large horizontal propeller type pump.

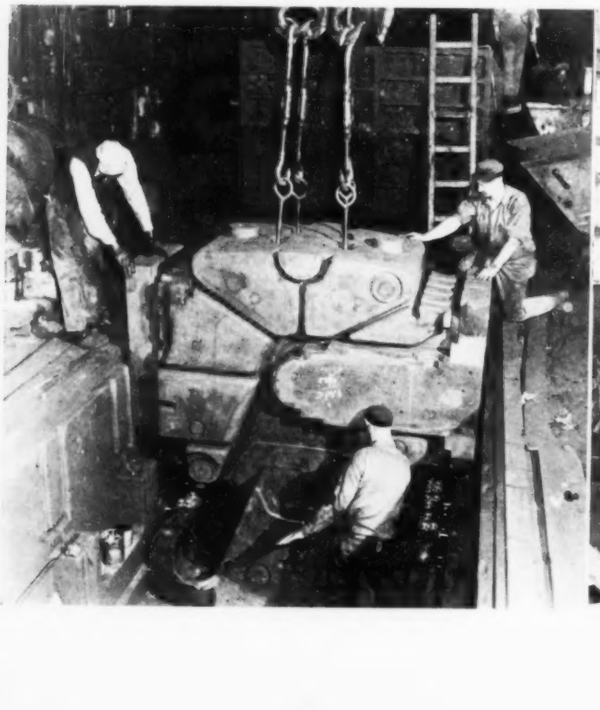


(Left) Largest gas engine-driven angle compressor ever built on its way to Panhandle Eastern Pipeline Company's Pleasant Hill, Ill., compressor station. This is first of five 10-cylinder 2400 hp., 250 rpm. Cooper-Bessemer compressors which will be used for the transmission of natural gas from Texas to Ohio. (Below) Officials inspect master connecting rod of compressor.

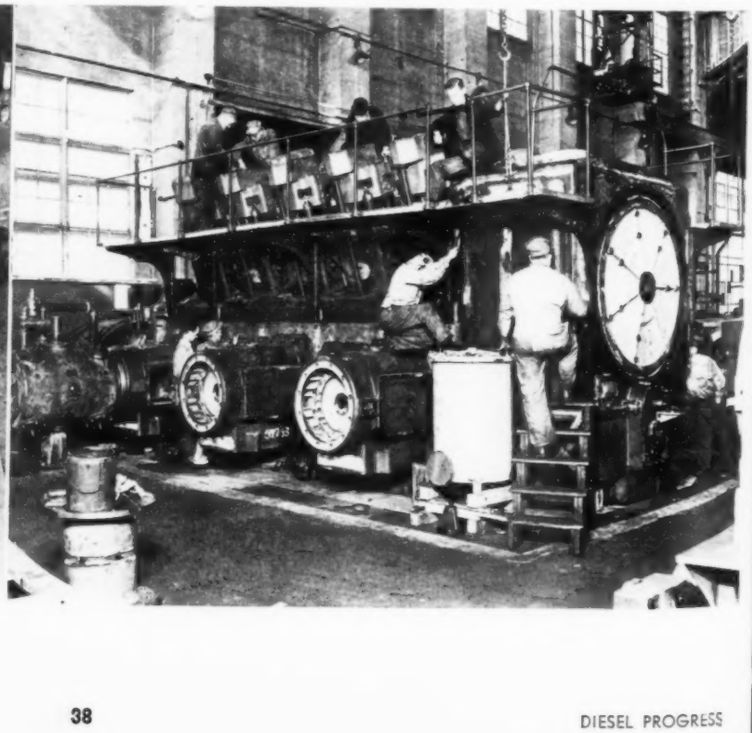


BUILDING THE WORLD'S LARGEST GAS ENGINE DRIVEN ANGLE COMPRESSOR

Preparatory to casting frame of Cooper-Bessemer type GMW compressor, foundrymen place 8-ton core in position. The frame weighing 30 tons was poured in two minutes and seven seconds.



View of Cooper-Bessemer compressor in company's Mount Vernon, Ohio plant. At this stage it was approximately 80% completed. Size of unit can be judged by men working on it.



PARALLEL OPERATION OF ALTERNATING CURRENT GENERATORS

By G. L. OSCARSON*

I. Requirements for Parallel Operation

1. Assuming that electrical and mechanical characteristics, such as flywheel effect,[1] synchronizing torque, voltage, wave form,[2] etc., are correct for parallel operation of engine driven alternators, there are two principal additional requirements which must be met. The first is that kilowatt division of load (and corresponding engine horsepower) must be proportional to rating. The second is that the reactive (magnetizing) component must be divided proportional to generator capacity.

II. KW Load Division

For any given load condition, there exists a fixed amount of kw. load to be divided among the operating units. If one unit carries more than its share of the load, some other unit or units must be proportionately underloaded.

2. Generators driven by engines provided with motor controlled governor are synchronized as closely as possible to bus frequency. When the line switch is closed, the incoming unit will stay in step but will not deliver energy to, or receive energy from, the system. To enable the generator to deliver power the governor must be adjusted to call on the fuel pump to deliver more fuel to the cylinders. Then, in turn, the engine will attempt to increase its speed. Since the generator is synchronized with the system, this is not possible and the additional pull, or torque, is reflected by increased kilowatt output of the unit.

3. To secure proportional load division at all loads on units controlled as above, the *speed droops* must be identical and load must be *proportionately divided* at some one load condition by proper manipulation of the governor control switch. See Fig. 1. Rate of change of speed of units should be nearly the same or hunting may result. Decreasing sensitivity setting of the unit or the units with too fast response will correct this. Load division will then be correct at all loads.

4. Small high speed units are rarely equipped with remote governor speed control. Proper speed for synchronizing is obtained, not by governor adjustment, but by manual manipulation of the throttle arm. Consequently the no-load speed setting is not altered in synchronizing. If *speed droop* and *no-load speed* are similar, the kw. division of load will then be correct at all loads.

Load division is a function of *governor adjustment* alone and cannot be affected by changes in excitation.

III. Excitation Requirements

1. Alternating current loads, in general, have two components: (a) A *kilowatt* component consisting of energy flow from the generator to the load; and (b), a *reactive* (magnetizing) component in which energy flows back and forth between load and generator, or between two generators, both at twice the system frequency. These two combine to form the total kva. The kilowatt load registers on the watt-hour meter. The net result of the interchange of magnetizing power between generator and load is zero, and does not register except as it may be reflected in I^2R losses.

2. The power factor of the system is the ratio of load *kilowatts* to total kva. As the power factor approaches unity (comes closer to 100%) the reactive component decreases. When kva. exceeds kw. the power factor is less than unity.

3. Power factor may be either *lagging* or *leading*. It is lagging when current change, per cycle, follows voltage change. That is the normal condition when the load consists of fluorescent lights, neon lights, motors, transformers and other inductive appliances.

4. Power factor is leading when current change, per cycle, precedes the voltage change. This happens only when a large capacitive (condenser) effect exists on the line.

5. Alternators are commonly rated at full load, 80% lagging power factor. They will carry full load and maintain rated voltage if the ratio of load kilowatts to total kva. is not less than 0.8.

6. On *lagging power factor* load, the generator field current must be *higher* for the same kilowatt load than for unity power factor. The lower the power factor, the higher must be the excitation for normal voltage. It is therefore considered that the generator supplies magnetizing reactive kva. to the system for lagging power factor load.

7. On *leading power factor* loads, the generator field current is *less*, for the same kilowatt load, than for unity power factor. It is considered that the load supplies magnetizing reactive kva. to the generator in such cases.

8. At any given load, the total reactive component is as fixed a quantity as is the kilowatt load. Assume that two alternators are operating in parallel on a unity (100%) power factor load and that each is operating at 100% power factor. If excitation is increased on one generator, there will be no effect on system voltage if excitation on the other unit is decreased accordingly. The principal effect will be to

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* *Chief Application Engineer, Electric Machinery Co.*

[1] Natural frequency at which a rotor tends to oscillate is covered by following:

$$F = \frac{35200}{rpm} \times \sqrt{\frac{P_r \times f}{Wk^2}}$$

where F = beats per minute
rpm = speed in revolutions per minute
P_r = KW per radian displacement of rotor at synchronous speed
f = cycles per second
Wk^2 = flywheel effect (lb.-ft.^{2})

The natural frequency F must differ by at least 20% from impressed frequency of any of the units operating in parallel.

The flywheel effect must also be sufficient to limit maximum periodic displacement, resulting from power impulses, to ± 3½ electrical degrees from a uniform rotative speed.

[2] Wave shape may be quite important. This is particularly true on 3 phase, 4 wire machines operating with grounded neutral. If machines are dissimilar the presence of triple harmonics (3rd, 9th, etc.) can result in quite heavy line currents between machines, and in neutral, at no load.

cause each unit to operate at a higher kva. output.

9. The kilowatt loading is unchanged by excitation change as mentioned previously. Since the kva. is increased, with no change in kilowatt load, the power factor on each unit must now be less than 100%. The generator with the increased excitation is now operating at a lagging power factor, delivering magnetizing kva. to the system. However the load originally was unity power factor, requiring no magnetizing kva., so the over-excited generator is delivering magnetizing kva. to the under-excited machine. That generator is then operating at leading power factor. Note that the power factor of the external load has not changed. What is commonly called a "circulating current" is flowing between the two generators.

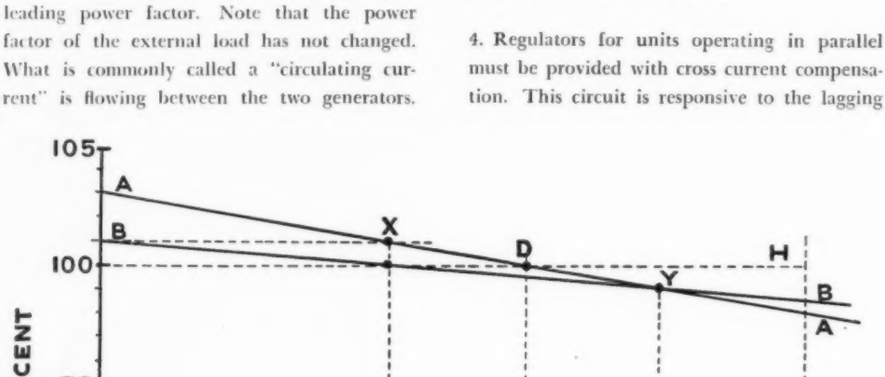


Fig. 1. Speed vs. load characteristics of two engines A and B when speed droops are not identical.

Actually an out-of-phase component is transferring magnetic energy from the overexcited unit to the underexcited one during one quarter-cycle and returning it the next.

IV. Function of Voltage Regulator

1. Just as the governor has the function of providing the proper amount of fuel to the engine, the regulator has the function of providing proper excitation to the alternator. This excitation is required:

a—to maintain proper system voltage.

b—to divide the reactive kva. component properly.

To secure this result, four requirements must be met:

a—No load voltage must be the same.

b—Voltage droop must be the same.

c—Cross current compensation must be the same.

d—Speed of response should be approximately the same.

2. Obviously if one regulator tries to maintain higher voltage than some other regulator, it will supply its generator with too much excitation. Therefore the no load setting must be identical and must not be altered after units are synchronized.

3. Likewise some regulators are set to provide a definite voltage droop from no load to full load. This droop must be the same to obtain proper excitation at all loads.

4. Regulators for units operating in parallel must be provided with cross current compensation. This circuit is responsive to the lagging reactive current component only, and the action is to try to reduce its value by reducing the excitation. That is, an increase in this lagging component tends to force down the exciting current. The total reactive component is fixed by the nature of the load and thus if all regulators resist an increase in reactive current by proportionate attempts to decrease excitation, the result will be an equitable division of reactive kva.

5. If speed of response of one unit is too fast hunting may result. Decreasing sensitivity of the regulator somewhat may correct this.

V. How to Secure Proper Parallel Operation

1. First determine that speed droop is the same. Check the no load speed. Then connect an appreciable load and measure the speed.

$$\text{(a) Speed droop (\%)} = \frac{\text{no-load speed} - \text{load speed}}{\text{no load speed}} \times \frac{\text{kw. rating}}{\text{kw. load}} \times 100$$

2. There will be a slight error as the speed drop may not be exactly proportional to load. However, if an appreciable load, say 50% is used, the error will be slight. If speed droops are different, adjust so they are the same.

Droops may vary from practically zero with hydraulic governors to 3% to 5% on small high speed units with mechanical governors.

3. If the machine is equipped with remote governor control switches, adjust individual governors, after synchronizing, to secure proper system frequency and load distribution in kilowatts. The load division will be correct at all loads if speed droop is properly adjusted as described above.

4. If engines are under throttle control for synchronizing, they should be checked to see that they have the same droop and the same no load speed. They will then divide the load properly after synchronizing.

5. The voltage regulators should be set at the same no load voltage and, if there is a voltage droop adjustment, it should be set to secure the same droop. To do this, check the no load speed and voltage. Connect an appreciable load (preferably half to full load) to the genator. Check engine speed and voltage. Repeat on other units being sure engine speed droop is consistent and that the power factor of the load is unchanged. Then neglecting the speed droop,

$$\text{(b) Voltage droop (\%)} = \frac{\text{no-load} - \text{load voltage}}{\text{no-load voltage}} \times \frac{\text{kw. rating}}{\text{kw. load}} \times 100$$

6. The cross current compensation adjustment should then be set alike on all regulators. Instructions for this accompany the regulator or can be obtained from the regulator manufacturer. Cross current compensation is correct when all units are operating at the same power factor, lagging or leading, assuming they are all designed for normal 80% power factor operation.

7. It is possible to check kilowatt load of units operating in parallel even if a wattmeter is not available. Put the excitation under manual control and adjust the excitation on the unit being checked until the a-c ammeter drops to

. . . . *And now please turn to page 87* . . . .

INGALLS-BUILT DIESEL LOCOMOTIVE AFTER ONE YEAR

By DOUGLAS SHEARING

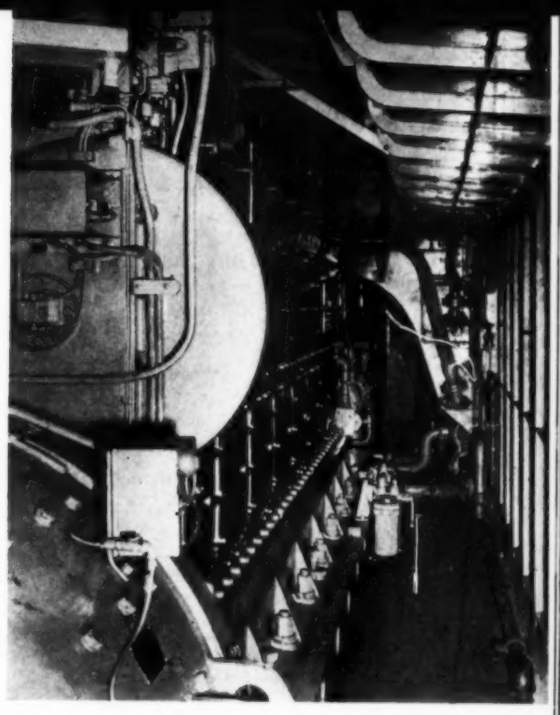
FOR over a year now, The Gulf, Mobile and Ohio Railroad has operated its Ingalls-built Diesel-electric locomotive in regular service and recently has released some operating cost figures covering this period of operation. The locomotive is operating in freight service between Mobile, Alabama, and Laurel, Mississippi—a distance of 110 miles. However in connection with this assignment there is a great deal of switching to be done along the line which is of a heavy nature. In addition to this there are some long grades, as much as 0.9%, which must be handled by the Diesel locomotive with its 2,400-ton consist. It is the type of duty on which the Diesel seems to thrive. Designed as an all-purpose locomotive by the Ingalls Shipbuilding Corporation, this Diesel-electric is showing its all-purpose qualifications.

The locomotive is equipped with a 1650 hp. Superior Diesel engine. It is a four cycle Elliott-Buchi turbo-charged type operating at 660 rpm. In actual service, however, the Diesel has been developing considerably more than its rated horsepower and with no signs of wear or stress. The electrical equipment installed was manufactured by the Westinghouse Electric Corporation.

The construction of the locomotive offers 360° vision from the cab, which is a great help in both freight and switching operations. Also operation is possible from both ends of the locomotive making turn arounds unnecessary. If multiple operation is desired, it is easily accomplished as all necessary jumper and air connections are installed.

The underframe and body are of all welded steel construction. The underframe has 14 inch H-beams for center sills with a heavy plate across the top and bottom of the sills, making in effect a box girder. The trucks are of swing bolster type, with 8 triple coil springs and 2 quadruple full elliptic springs. The trucks have two axles each, with traction motors geared to each axle.

There is a portable hatch in the engine roof for access to the Diesel and in the event of the removal of the engine the entire roof over the engine may be removed. This makes for ease of maintenance.



Interior view of locomotive showing 8 cylinder supercharged Superior Diesel.

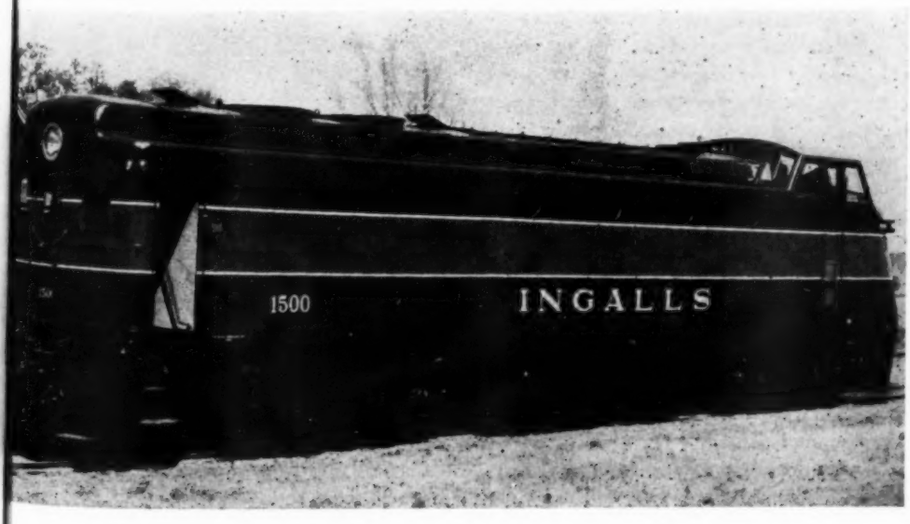
The economy of operation cited in the figures below reflects well on the equipment which Ingalls has installed in these all-purpose Diesel locomotives.

Following are cost figures furnished by the Gulf, Mobile and Ohio Railroad covering the Ingalls Diesel-electric since it has been in service:

	Cost per 1000 Gross Ton Miles	Cost per Train Mile
Fuel	$0.1171	$0.1309
Water	.0004	.0004
Lubricants	.0198	.0221
Other Supplies	.0049	.0055
Repairs	2583	.2887
	$0.4005	$0.4476

Among the suppliers who cooperated with the Ingalls Shipbuilding Corporation in equipping this Diesel-electric locomotive were the American Blower Company—radiators and fans; The Diamond Chain Company—accessory drives; Ross Heater Company—oil cooler; Purolator Company—oil strainer; Falk Corporation—flexible coupling; Minneapolis-Honeywell Regulator Company—shutters and shutter control; Paxton Diesel Engineering Co.—Bearing Watchdog system; Electric Storage Battery Co.—batteries; Timken Roller Bearing Co.—roller bearings; CO-TWO Equipment Co.—fire extinguishers; and the Nugent Company—oil filter.

Rear view of 1650 hp. Ingalls locomotive showing cab's windows which give 360° vision to operator.



A NOVEL TYPE OF WATER-STEAM DYNAMOMETER

By KALMAN J. DeJUHASZ*

IN the course of the investigation of the Technical Industrial Intelligence Committee of the Foreign Economic Administration, a novel type of engine dynamometer was discovered in Germany which is of possible interest for the American Diesel engine industry.

This is a steam-water dynamometer, developed jointly by the well-known Diesel engine manufacturing concern of Motoren Werke Mannheim, A.G. (M.W.M.) and the Carl Schenck A.G.—Darmstadt, manufacturers of balancing and material testing machines.

The advantages of this dynamometer are: utilization of heat, and a reduced water consumption compared with the usual types of hydraulic dynamometers. The essential principle is that the water in the dynamometer is allowed to evaporate, i.e., to be converted into steam of low or high pressure, which is then utilized for plant heating, processing and other purposes.

One horsepower hour is equivalent to 2546 B.T.U., which is approximately equal to the heat necessary to produce 2.2 lb. steam; therefore in a large engine testing plant, a sizeable amount of steam can be produced and economically utilized.

These brakes were designed in two types:

1. Low pressure brake, Fig. 1, intended for 4.5 to 7.0 psi gauge pressure steam (about 225 to 230°F temperature). This construction was in actual use at the M.W.M. plant and the steam was utilized for plant heating.

2. High pressure brake, Fig. 2, intended for 80 to 110 psi gauge pressure (328 to 343°F temperature). This type was only in the experimental stage. The high temperature steam could be utilized not only for plant heating, but also for heating, electroplating and bonderizing baths, and for other processing purposes.

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*Professor of Engineering Research, the Pennsylvania State College. (Formerly scientific consultant with the Foreign Economic Administration of the Department of Commerce.)

The low pressure brake, Fig. 1, consists of two sets of bucket wheels, the inner set *a* forming the rotor driven by the engine through drive shaft *o*, and the outer set *b* being attached to the outer casing and forms the stator which is supported in roller type trunnion bearings. The water is admitted through the axial pipe *c* and flows through passages *e* and *d* provided in the hollow shaft and rotor wheel. The water forms a ring in the peripheral region of the stator casing. The steam collects within the water ring, then it is carried by the pipes *f* to the chambers *h* arranged in the hollow shaft, whence it flows through perforations g and *l* to the collecting head *m*, which latter is attached to the left-side trunnion bearing housing. Owing to the centrifuging action of the shaft rotation water droplets are separated from the steam and thrown through the perforations *g* back to the water ring, therefore the steam is dry. Leakage of steam is prevented by graphite seal rings of special construction mounted between the rotor shaft and the stator.

Such dynamometers were used at the M.W.M. plant for testing submarine Diesel engines of 700 horsepower, and according to the statement of the interrogated German personnel, performed satisfactorily.

In the high pressure steam brake, Fig. 2, the inner set of bucket wheels 1 is attached to the stator, and the outer set of bucket wheels 3 is attached to the casing 2 and forms the rotor. This inverted construction is said to produce a more stable water ring. Both sets of bucket wheels, forming the brake proper, are enclosed within the boiler shell 6 which also forms part of the stator; the latter is suspended in the trunnion bearings 10 at both ends of the shaft. The trunnion bearing is not a roller bearing as it is in the low pressure brake, but is formed of crossed steel strips, having their virtual axis of oscillation in the axis of rotation of the shaft. It is stated that this type of suspension is superior to a roller bearing, because the latter is subject to "brinelling" action at prolonged running, while the steel strip suspension is not subject to such defect. Leakage is minimized by the graphite-ring type seals 9 provided at both ends of the stator. The advantage of this construction is that both flanged ends of the drive shaft 5 are available for the attachment of the engine, therefore the same brake can be used for either direction of rotation. On the other hand, the assembling and disassembling of the brake is rather difficult and cumbersome.

In operation the boiler 6 is filled with water up to the maximum water level which is indicated on a gauge glass. The water is admitted through pipe 11 and between the hollow shaft 7 and solid shaft 5 to the bucket wheels 1 and 3. By the rotation the water is distributed around the periphery of the rotor, and through holes 12 it enters the water space 13. Because in this space the water partakes in the rotation of the rotor, therefore a water ring is formed the radial thickness of which can be altered by manually operating (with lever 15) the scoop pipe 14. The scooped out water flows through passage 16 into the boiler space. The steam produced flows through passage 17 into the boiler space and is taken out at the highest point through pipe 18, fitted with valve 19. This latter serves to regulate the steam pressure. The boiler is provided with a safety valve 20, and with a circulating pump 21 (driven by belt 22) which directs the water from the boiler space through pipe 11 back again to the rotor. The evaporated water is replaced from a fresh water supply tank through an electromagnetically operated valve which comes into action automatically whenever the water level sinks to a predetermined minimum value.

The rotor is stressed only by the centrifugal force but not by the steam pressure because the pressures inside and outside of the rotor are equal.

At the right side of the brake only steam is present; the graphite ring seal 9 minimizes the steam leakage. At the left side, where the water is admitted, only water is present.

The boiler was designed for 220 psi pressure but in the experimental operation only 95 psi gauge pressure was used; it is claimed that no difficulty was experienced.

This dynamometer can be operated also as a water brake, in which case the power absorption capacity is greater. It was found to provide a very even torque, not influenced by pressure fluctuations, because the thickness of the water ring is determined by the position of the scoop 14.

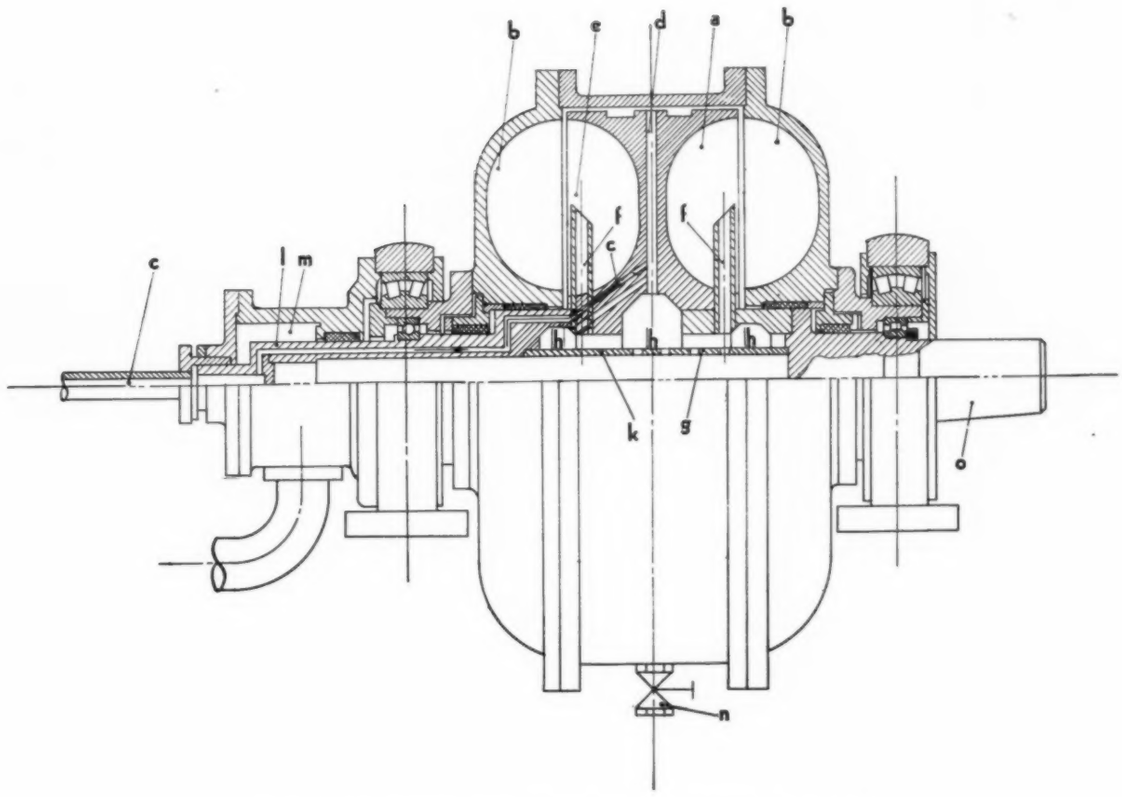
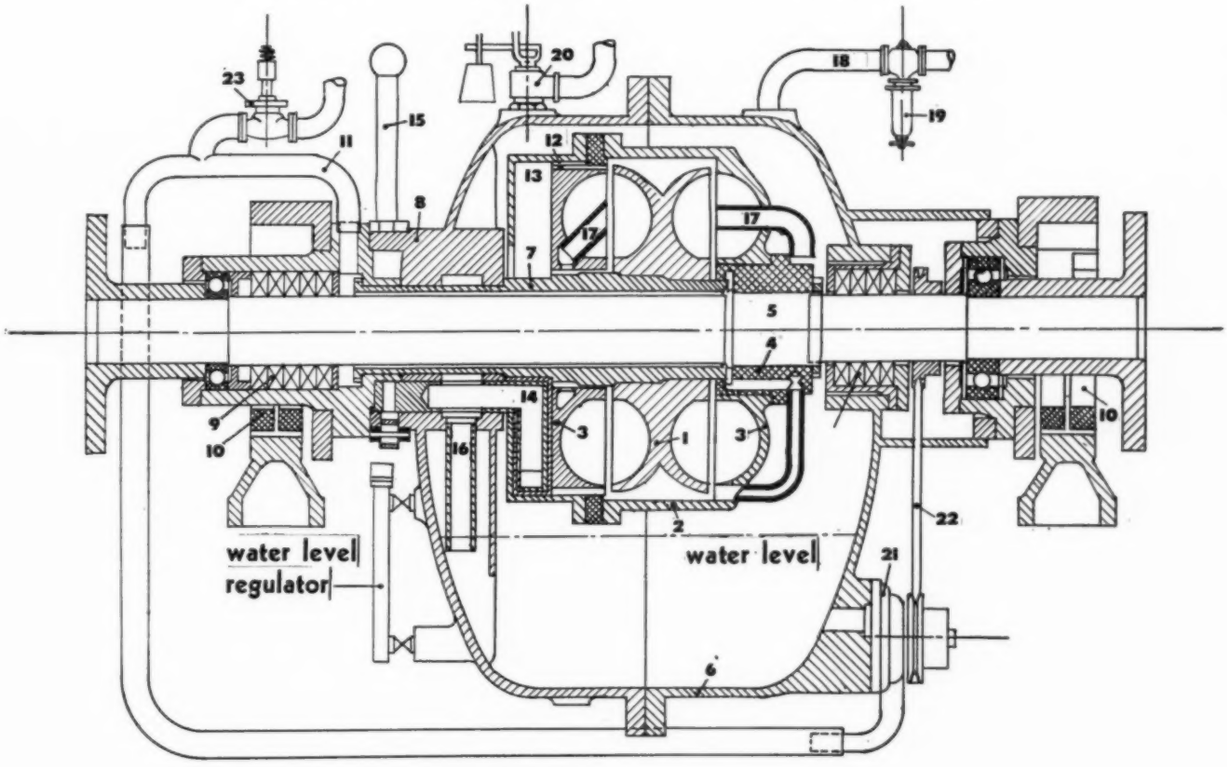
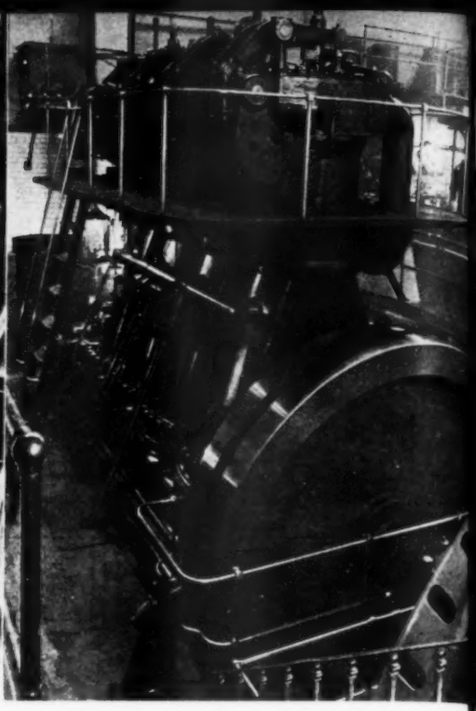


Figure 1. Low pressure steam dynamometer for pressures up to 7 psi.

Figure 2. High pressure steam dynamometer intended for pressures as high as 110 psi.



3000 hp. in Mirrlees Diesels enabled John Player and Sons, cigarette manufacturers, to continue production in England's coal shortage.



Built in 1918, 640 hp. Willans Diesel was brought back into service to supply power to the town of Gillingham, Kent.

DIESEL PROGRESS IN GREAT BRITAIN

PART III

By HAMISH FERGUSON

ALL the world knows that Britain was faced with an acute fuel shortage which, in February 1947, threatened the continuity of supply of electricity both to industry and to domestic consumers.

The electricity "Grid" system normally supplies a very large proportion of industrial requirements and practically the whole of the current required by domestic users. The balance of the industrial demand is supplied by individual concerns who maintain their own generating plants and in most cases Diesels are the prime-movers. The industrial consumers who were "self-supporting" were the lucky ones (or shall we say the more prudent?) for they were able to maintain full production using their available stocks of Diesel fuel. Among the domestic consumers there were many concerns such as large stores and office blocks who were independent and these were able to maintain their full lighting, heating and restaurant services while their less-fortunate neighbors were making-do with kerosene lamps and night-lights.

Improvisation was a matter of urgency—Diesel fuel was available while coal was held up and consequently all available Diesel generating sets were mobilized as rapidly as possible. Such equipment included sets which had been superseded by the "Grid" supply, the few second-hand sets offered for sale and the multitude of smaller portable generating sets which had become surplus to war-time requirements.

Surplus equipment included sets varying from 5 kw. to upwards of 1,000 kw. in self-contained units and those available were of both British and U.S. origin. In addition, there were usable generating sets of various makes which dated back to pre-First World War days.

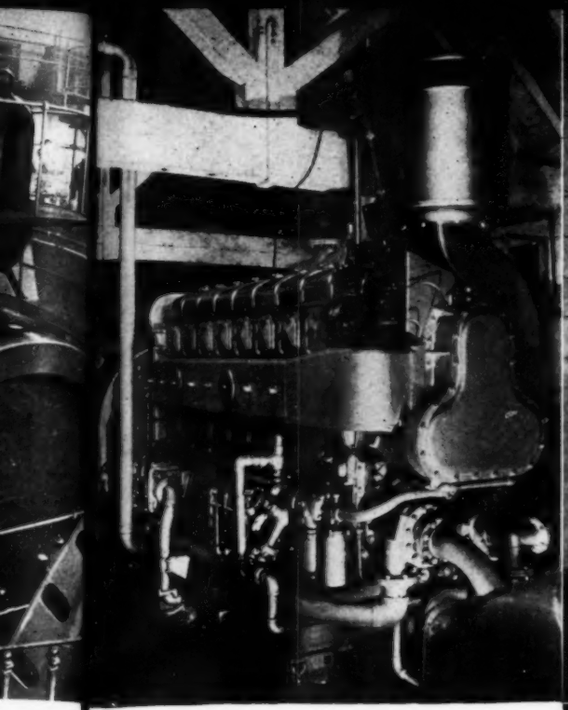
Improvisation was necessary and improvisation was carried out, irrespective of the condition or origin of the plant (ownership was, of course, respected) and results were achieved in a remarkably short space of time.

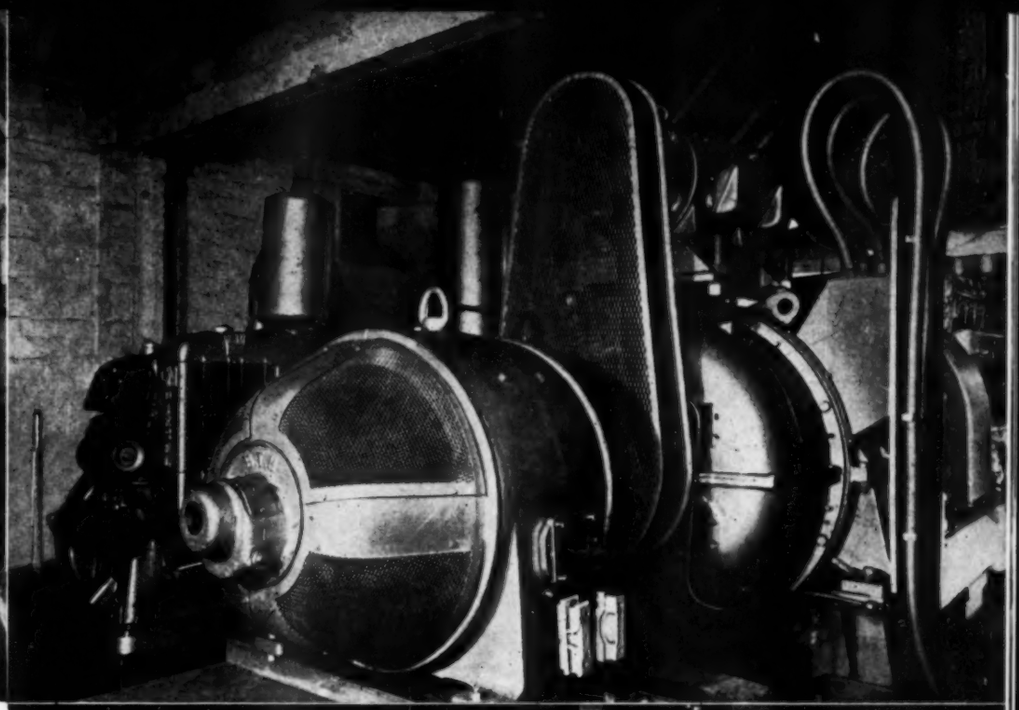
The photographs on these pages are representractive examples of what Diesels did and it is pleasing to see, once again, that two great nations can not only understand their kindred language but that they can also appreciate each others designing and manufacturing abilities so that available machinery can be put to the best use when emergency demands.

It might be of some interest to review the effects of the fuel emergency on the Diesel position in Great Britain generally. Prior to the emergency the tendency had been to supersede the individual Diesel stations by encouraging the undertakings concerned to take current from the Grid. This policy has now been reversed and all those who have Diesel generating plants in serviceable condition are being asked to operate them to relieve the Grid system which is supplied from the large central power stations which use coal for steam raising. No restrictions are at the moment being placed on the use of Diesel oil of which there are apparently ample stocks available.

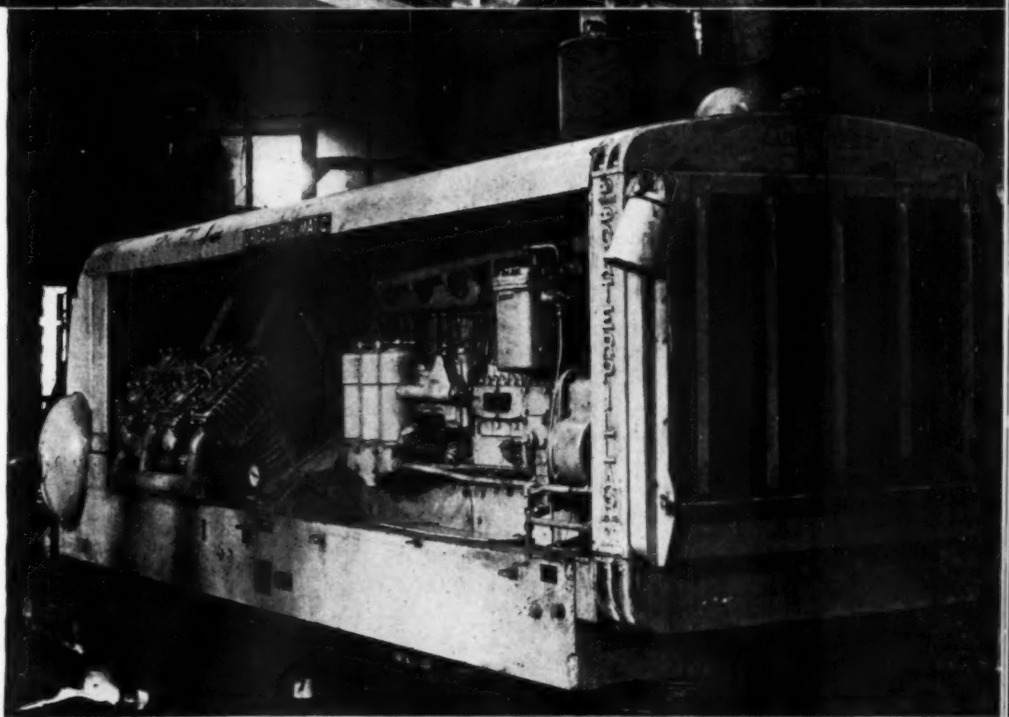
In addition to encouraging the use of existing Diesels the Government has sponsored a scheme for the production, with the highest priority, of 100,000 kva. of small self-contained ac. sets in units of about 55 kva. each. It is believed that these can be completed by 1948 without interfering with existing production so that the export orders already booked can be fulfilled. These sets will be allocated by the Ministry of Supply to the concern most in need of them.

There is much speculation as to what the power position may be during next winter. Coal stocks are being built up but the general feeling is that power cuts will be likely.



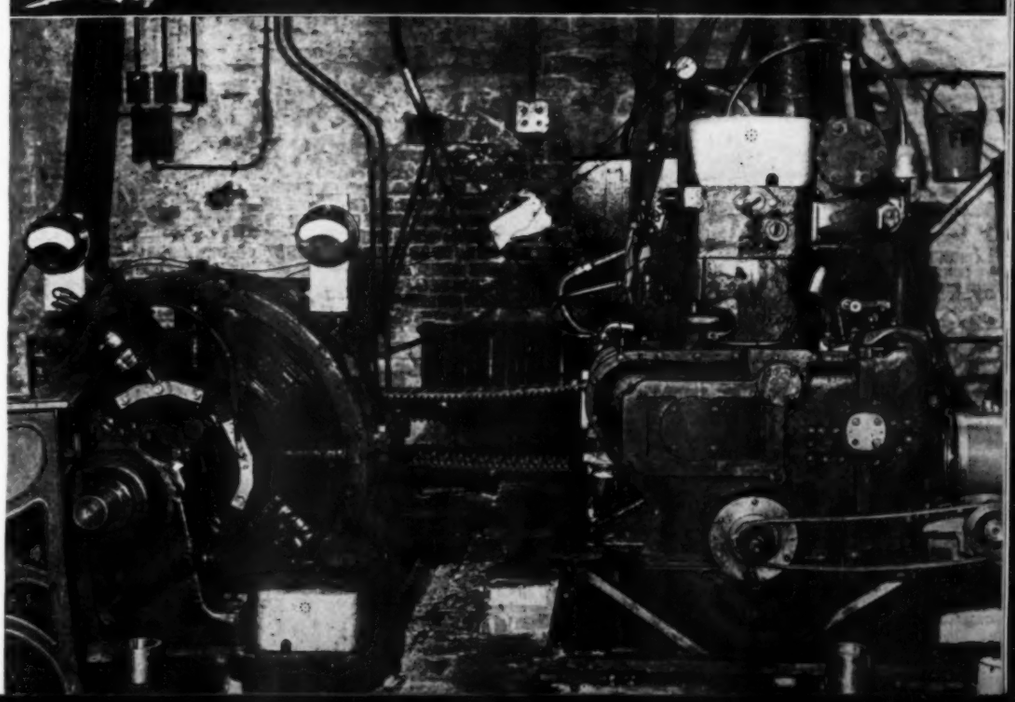


(Above and right) U.S.-built, 500 hp. General Motors-Diesel, installed during war for production of DC current was converted to AC current during crisis and production of plant was maintained.



(Right) This 128 bhp. Caterpillar Diesel installed at a printing plant drives air compressor for forge supply.

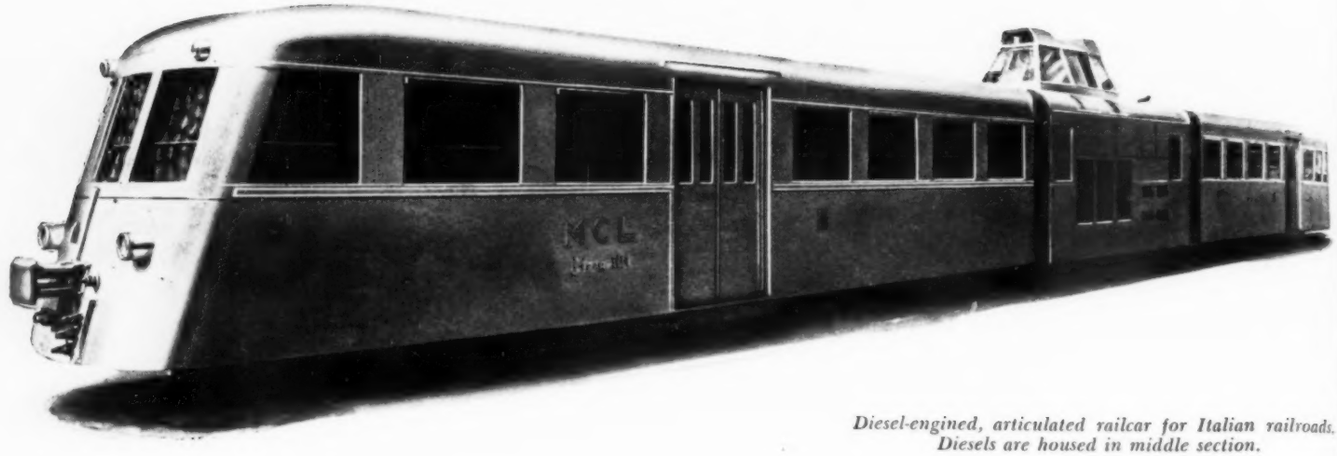
(Bottom) At same time 150 hp. M.A.N. Diesel drives makeshift alternator converted from DC motor in emergency.



To safeguard themselves against further loss of production many concerns, both large and small, are considering the installation of Diesel plants not only to act as stand-by to the Grid or to take the peak loads but to carry the basic load and thus become independent of the Grid altogether. It remains to be seen whether such a policy will meet with Government approval.

A policy which has been advocated in certain quarters is the installation of Diesels in factories to supply power to those machines which are in constant operation and demanding reasonably constant power. It is believed that by so doing the Diesel installation could be designed to operate at a steady and economical loading. The current required for machines operating intermittently or on widely varying loads would be taken from the Grid. By this means the Grid would be relieved of a considerable basic load and much coal would be saved.

Some pronouncement of Government policy is awaited but in the meantime many concerns are going ahead installing Diesels according to their own ideas. The fuel emergency has brought home to the Government and all power users the great advantages of Diesels.



Diesel-engined, articulated railcar for Italian railroads. Diesels are housed in middle section.

LIGHT WEIGHT DIESEL PR

By ANTONIO GIORDANO

POSTWAR developments in Italian railway traffic have increased the interest of Italian railway officials in the employment of light railway rolling stock. Particular reference is made to railcars, the latest design is that of the articulated type built by the "Reggiane" Officine Meccaniche Italiane to the order of the Strade Ferrate del Mediterraneo—Ferrovie Calabro/Lucane—the main features of which are summarized in Table "A."

The railcars in question are of all-steel construction. The outer covering is formed by steel plate panels of 1.5 mm. width electrically welded. The car ceiling is thermically insulated by three thicknesses of Isoflex.

The engine is built by the O. M. of Brescia operates on the Diesel cycle with direct injection. It has 12 cylinders arranged as a V of 60° developing 300 hp. at 1500 rpm. with an overloading rating of 20% for 20 minutes. The diameter of the cylinder is of 130 mm. and the stroke of 180 mm. Lubrication is accomplished under pressure through two gear pumps with independent circuits. The engine is fitted with an air compressor consisting of four cylinders having a stroke of 32 mm. supplying the brakes and the auxiliaries. The engine is provided in addition to fuel filters, with air aspiration filters and lube oil filters. Starting of the engine is effected by means of two electric motors situated each on one side of the main engine bedplate. These electric motors are of the Bosch type and have a power of 15 hp. They are operated from an accumulator set at 24 volts. Cooling of the engine is accomplished by water circulation through two centrifugal pumps: one for each group of cylinders. Three radiator groups are fitted vertically on each side of the motor car. Engine fuel is contained in four tanks of the capacity of 150 kg. each fitted in pairs on the trailers so that each railcar can dispose of 600 kg. of oil.

Control stand located above the main engine compartment affords 360 vision for operator.

The railcars are provided with a compressed air brake of the Westinghouse type with sudden and gradual action, and with a hand oil hydrodynamical brake.

The most interesting feature of these railcars is the cabin driver which is situated in the middle of the railcar itself over the motor group and which extends above the roof of the railcar in the shape of a turret wherefrom the driver can look both forward and aft and where is located the driving bench, the hand brake, the door controls and the telephone plant to connect the driver with the various parts of the railcar.

Heating of the passenger compartments in the trailers is obtained through aerothermic sets

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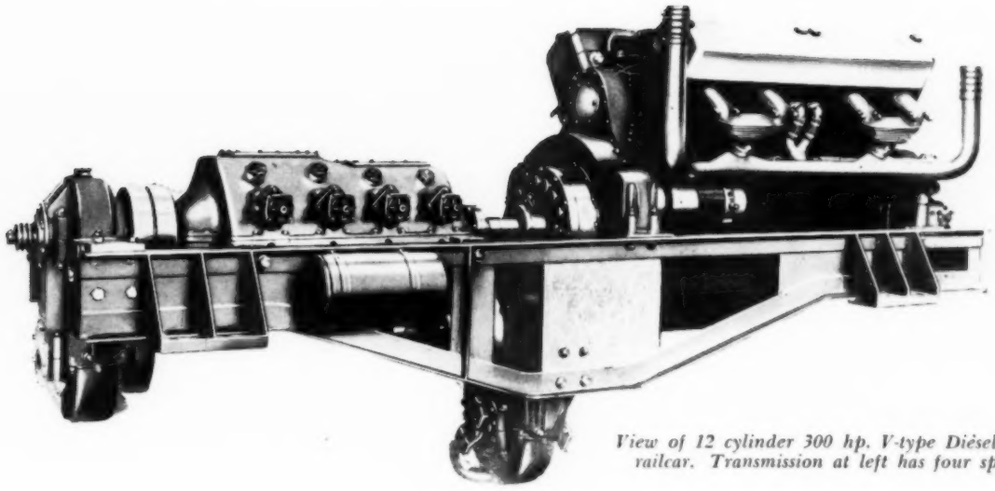


View of 12 cylinder 300 hp. V-type Diesel installed in railcar. Transmission at left has four speed ratios.

PROPELLED RAIL CARS IN ITALY

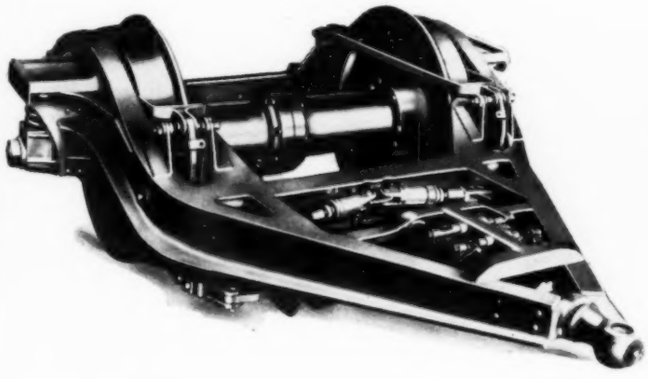
using the heat contained in the engine cooling water. In order to speed up the initial heating and to improve it during the trip arrangements are made to render possible the exploitation of the exhaust gas.

The walls of the passenger compartments are covered with polished faesite panels with anti-corosive framings and the ceiling is in white varnished plywood. The floor is covered in linoleum. The seats are adjustable so that passengers can travel most comfortably. All the framing of the seats and other fittings of the compartments are in light metal. Large windows with glass openings are provided. Such railcars are employed on the Calabrian railways operated by the Societa Strade Ferrate del Mediterraneo.

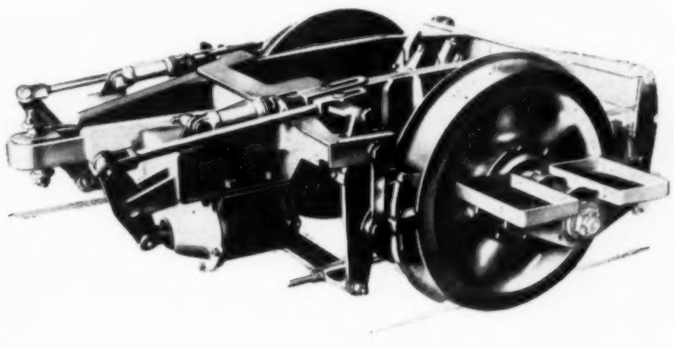
This new type Italian railcar is provided with an Ansaldo type DF speed reducing transmission which is mounted on an extension of the engine bedplate. The following speed ratios are possible: 1:1; 1.305:1; 1.79:1; 2.54:1; 3.84:1. The ratio of engine speed to wheel speed becomes 2.76:1; 3.60:1; 4.95:1; and 10.6:1.

TABLE A

Gauge	.95 m.
Length between buffers	28.84 m.
Height of body (empty)	2.763 m.
Maximum height of cabin (empty)	3.750 m.
Maximum breadth	2.434 m.
Height from rail	.630 m.
Distance between bearing bogies	22.530 m.
Distance between motor bogies	3.650 m.
Diameter of wheels	.725 m.
First class accommodations	10
Second class accommodations	94
Standing room	100
Engine rating	300 hp.
Maximum speed	75 km./hr.
Weight of railcar (empty)	28.4 tons
Total weight at normal load	36. tons
Total weight (heavy load)	43.6 tons



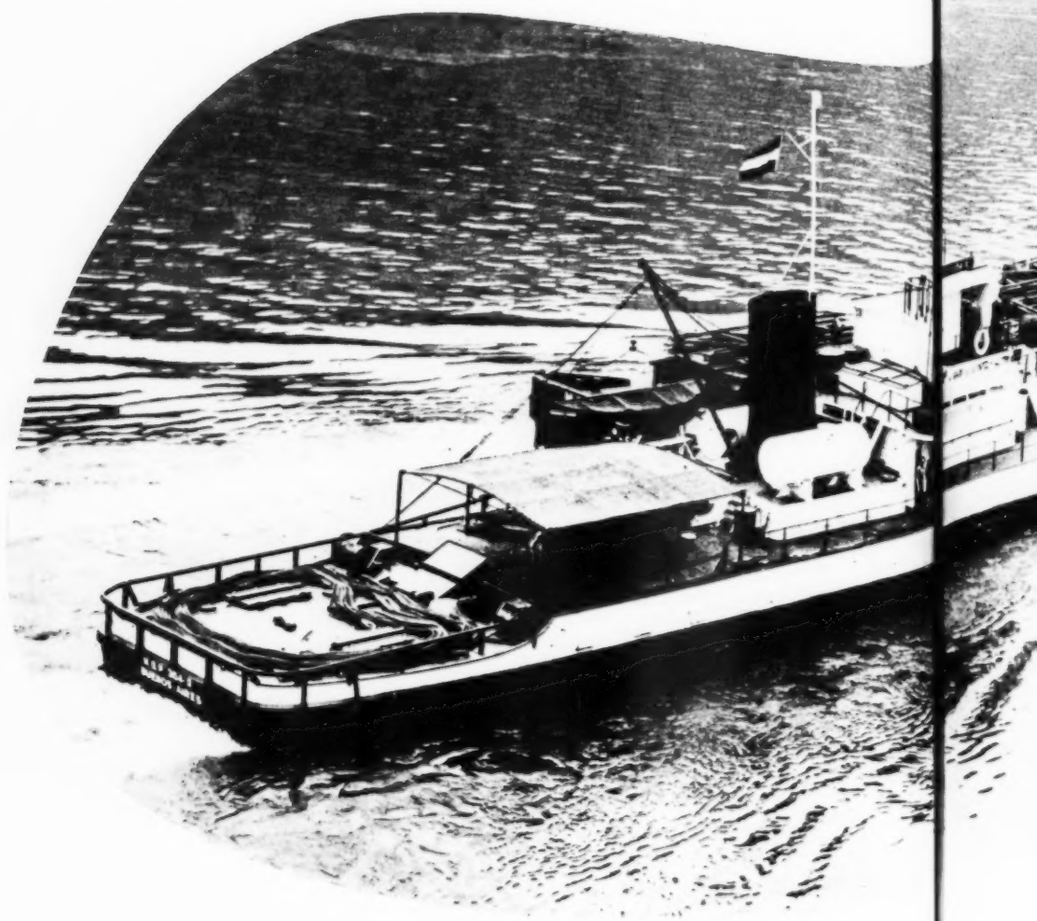
Motor bogie of articulated railcar.



Trailer bogie of Italian railcar.

THE *VICTORY* GOES TO ARGENTINA

DRAVO TOWBOAT TO AID SOUTH AMERICAN RIVER TRANSPORTATION

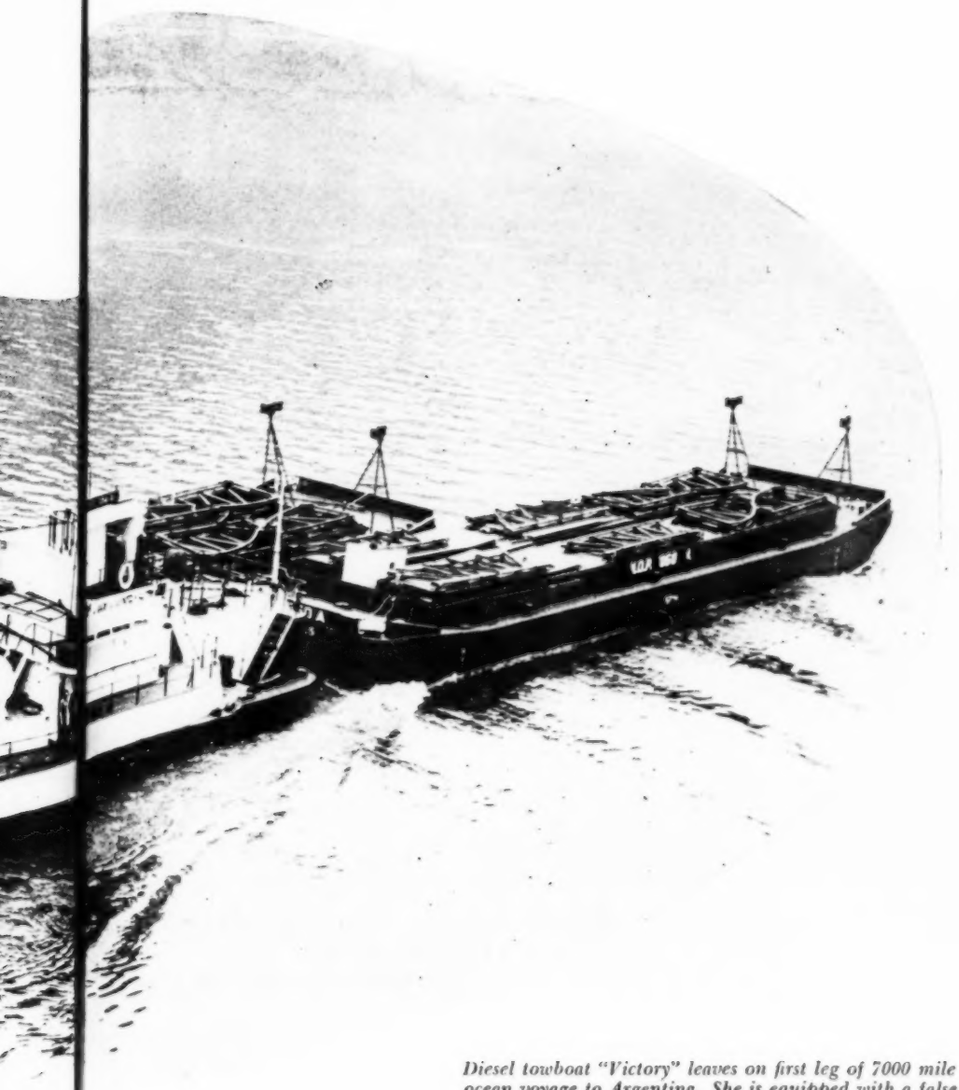


By DOUGLAS SHEARING

ONE of the largest purchases of river transportation equipment ever made in this country by a foreign government was made recently. The order called for delivery to the Argentinean government of the twin-screw 760 hp. Diesel towboat *Victory*, for several years the key boat in Dravo's Keystone Division fleet; two new larger twin-screw pushing towboats each rated at 1000 hp.; four new steel deck barges for hauling sand and gravel; and 10 new weatherproof covered cargo barges. The *Victory*, renamed *M.O.P. 304R*, and four sand and gravel barges began the long voyage from Pittsburgh to Buenos Aires May 17 with delivery of the remaining boats and barges scheduled to be completed during 1948.

The towboats and barges are being purchased for a transportation system intended to serve the rich agricultural and industrial areas along the Parana, Uruguay and Paraguay Rivers and to aid in the development of these areas under the Argentine Five Year Plan. These rivers have a total length of 2,330 miles, are navigable for nearly 2,000 miles, and encompass an area comparable to that of the Mississippi and Ohio Rivers. Production in this area has been expanding rapidly and the capacity of the combination freight and passenger steamers now operating there is inadequate to meet the needs. Acquisition of the equipment, according to the decree of President Peron of Argentina, "will determine the possible limit of enlarging the system of push towing navigation in this country—in the same way as realized in the fluvial system of the Mississippi in the U. S., in which very high tonnage is transported." He added that demand for shipping capacity will be even larger "with realization of the Five Year Plan."

The towboat *Victory*, when it was built at the Dravo yard in 1940, was hailed as creating a new trend in towboat design. It incorporated an improved hull and Kort nozzles which increased as much as 25 per cent the effective push of the boat. The main deck level was raised three feet above the fender line, giving the vessel more freeboard than previous flush deck designs, a feature which now permits it



Diesel towboat "Victory" leaves on first leg of 7000 mile ocean voyage to Argentina. She is equipped with a false bow for ocean travel. Two sand and gravel barges seen will be towed astern in open water.

to make the sea voyage to Buenos Aires under its own power. Superstructure and hull are of all-welded steel construction. The hull is 135 ft. x 27 ft. x 11 ft. 9 in. The Diesels are Cooper-Bessemer.

The *Victory* has been equipped with a false bow and anchor tackle, radio and navigation instruments for the sea voyage from New Orleans. It will tow two sand and gravel barges, each carrying the complete sub-assemblies for another barge of the same type. Route of the voyage will be down the Ohio and Mississippi to New Orleans, across the Gulf of Mexico, down the east coast of South America to the Rio de la Plata, and up this estuary to Buenos Aires. The four sand and gravel barges, each 135 ft. x 27 ft. x 8 ft., are expected to be used principally in the Plata, at the confluence os the Parana and Uruguay rivers, which is 100 miles long and up to 56 miles wide and is kept open to ocean vessels by constant dredging.

The 10 steel-hulled barges with rolling hatch covers, capable of carrying dry or perishable cargo, will be of Dravo standard Mississippi River design modified to cope with the sometimes rough waters of the Plata. They will be 195 ft. x 36 ft. x 11 ft. Their great cubic capacity will permit economical hauling of agricultural products, including mate tea, tung oil, linseed oil, cereals, lumber, fruits, sugar and miscellaneous cargo, much of it bulky but light in weight. When completed, the barges will be shipped unassembled by steamer. Work also has started on the two new towboats, each 145 ft. x 27 ft. x 11 ft. 9 in., which will make the trip to Argentina under their own power.

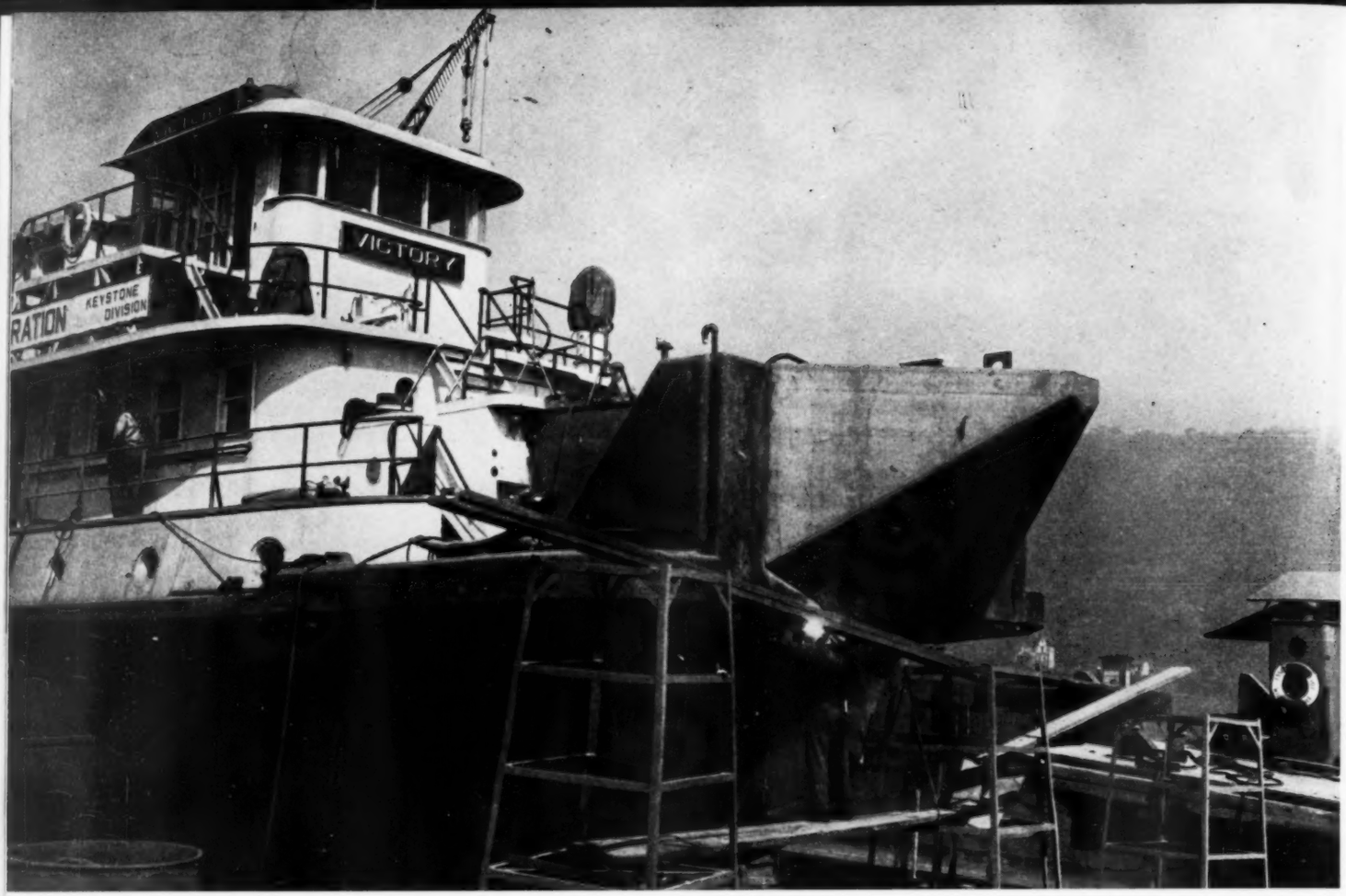
Purchase of the river equipment followed by some months last year's inspection of inland navigation methods in the U. S. by an Argentine mission appointed by General Don Juan Pistarini, Minister of Public Works. The invitation to visit this country was tendered by Dravo Corporation and the delegation was headed by the Director of Fluvial Navigation.

Under terms of the contract, Dravo will provide facilities for training captains, engineers, and mates in the handling of the three towboats to assist them in inaugurating this type of river transportation in Argentina. Training will be carried on in the Ohio and Monongahela river area. Board Chairman W. K. Fitch and engineers of Dravo Corporation have just returned after several weeks spent in the Argentine inspecting the river system.

The *Victory* is one of three sister towboats which were built in 1940 and described in DIESEL PROGRESS in January 1941. *La Belle* and *Semet-Solvay* were the other two boats built by the Dravo Corporation. The *Victory* has a sizeable power plant with her two 6-cylinder, four cycle, 380 hp., 310 rpm. Cooper-Bessemer direct reversing Diesels. Auxiliary power is developed by a 7½ kw. generator on the starboard main engine and by a six cylinder Superior Diesel driving a 35 kw. Crocker-Wheeler generator and a six cylinder Hercules Diesel driving a 40 kw. Crocker-Wheeler generator. Both of the latter installations have Korfund vibration dampeners. Compressed air is furnished by a Gardner Denver 5¾ x 2½ x 5 inch two stage compressor driven by a 20 hp. Westinghouse motor. The auxiliary air compressor is built into the port main engine and is of Gardner Denver manufacture. Maxim silencers are installed on main and auxiliary Diesels.

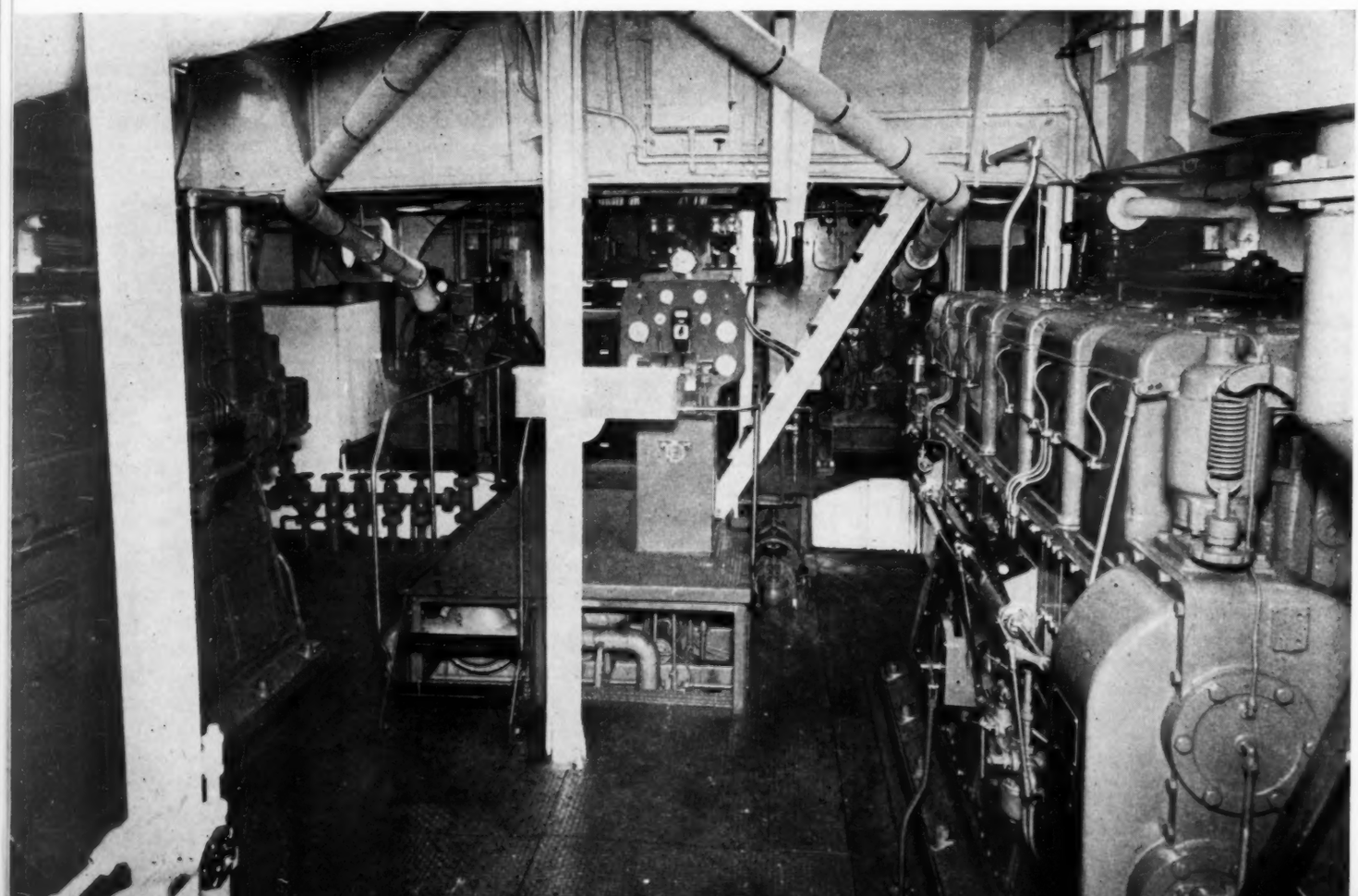
Steering power is supplied by two De Laval "Imo" pumps of the positive displacement, double suction type, driven by a 10 hp. Westinghouse motor. A Briggs lube oil clarifier is installed.

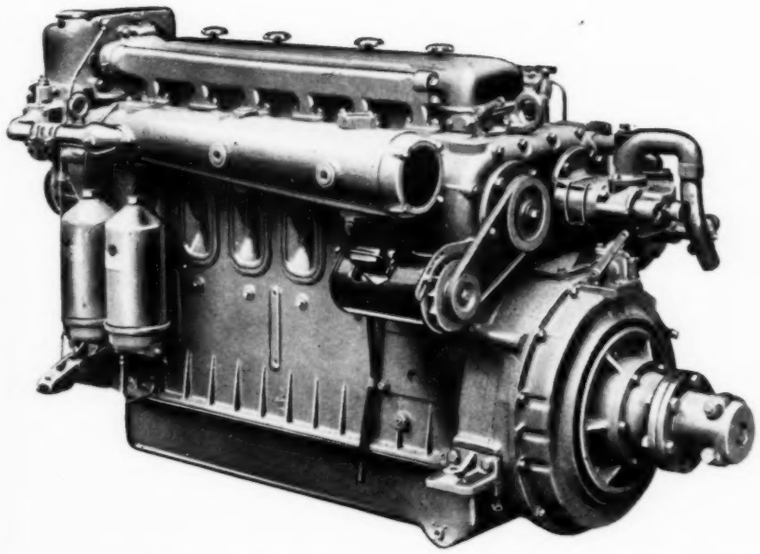
Before starting for Argentina special care was taken to secure all portable equipment such as tools, spare parts, and other gear that under sea conditions might cause trouble.

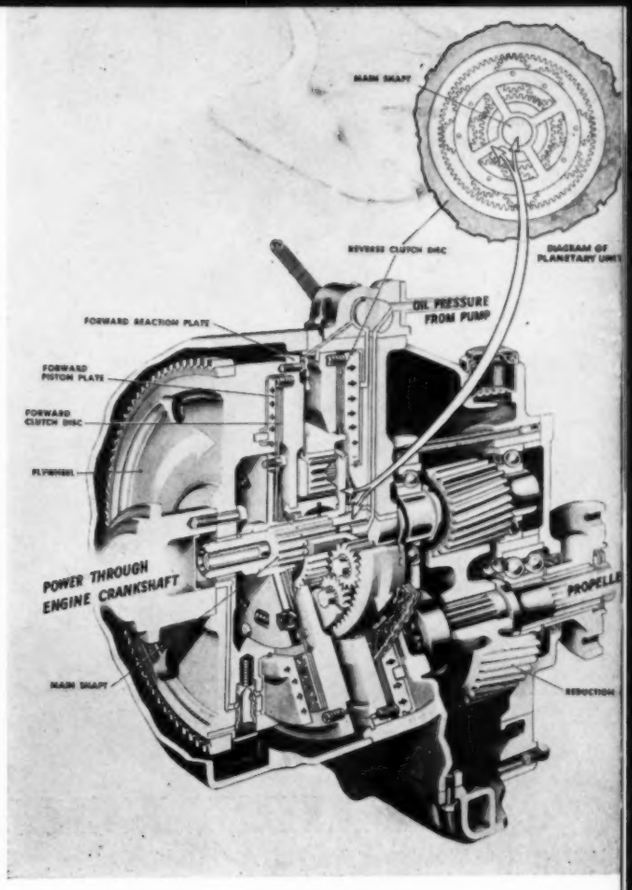


Seaworthiness of "Victory" improved by addition of a false welded steel bow. Other alterations included removal of river type hatches, bulkheading of all openings with steel plate, and the securing of all portable equipment including furniture, tools and spare parts.

View of "Victory's" engine room showing 2 Cooper-Bessemer 6 cyl., 4 cycle, 380 hp. main propulsion Diesels. Hercules and Superior auxiliary Diesels (background) are Korfund-mounted. Main engines equipped with Briggs clarifiers.







General Motors Series 71 marine Diesel engine with new hydraulic direct drive reverse gear. (Right) Cutaway drawing of reverse gear.

NEW FLYWHEEL-MOUNTED MARINE GEAR

A NEW hydraulic gear, entirely engineered and produced by General Motors, has actually been designed as an integral part of its Series 71 Diesels. The engine flywheel is employed as a component part of the gear mechanism and has enabled the corporation to offer a matched marine engine and hydraulic gear combination as an integrated unit of one manufacture. Savings in weight up to 40% and in size up to 50% have been accomplished in the hydraulic gear over other gear types. This can probably be most clearly demonstrated by the fact that the combined flywheel and forward shifting mechanism occupies approximately the same space as the conventional flywheel. One of the most outstanding features of the new gear is the ease with which the shifting mechanism can be actuated. Only a light finger pressure of 7½ pounds is required to move the 4-inch shifting lever from the forward to reverse position.

Direct drive hydraulic marine gears are made up of three functional units:

A. A control valve actuated by a small lever which regulates the flow of oil into the gear box.

B. A flywheel assembly made up of a clutch disc which si splined to the drive shaft and positioned between a forward reaction plate and piston plate. This constitutes the entire forward driving mechanism.

C. A reverse gear aft of the forward drive and consisting of a ring of planetary gears for accomplishing reverse rotation together with a stationary reaction plate and second clutch which engages the planetary system.

In operation, both the direct drive and reduction gear types function in essentially the same manner, except that in the direct drive unit oil is supplied from the engine oil pan whereas with reduction gears the oil supply is carried in the reduction gear housing. A positive displacement pump mounted on the flywheel housing and driven by the engine supplies oil at the proper pressure for operation of the clutch engaging mechanism. Oil is admitted to the gear box through three grooved passages, one for forward speed, one for reverse speed, and one for lubrication of those parts not subject to splash lubrication. The lubricating passage is never cut off regardless of the position of the control valve.

With the control valve lever in the forward position, oil under pressure is admitted behind the forward piston plate moving the plate so as to grip the clutch disc between itself and the reaction plate, thus causing the clutch and the drive shaft to turn in a clockwise rotation with the engine.

When the control lever is moved back through neutral into the reverse position, oil is directed against a second piston plate which locks the reverse clutch disc against the stationary reaction plate. Since the outer ring of the planetary system is splined to the clutch plate, it too is locked in a stationary position when the clutch is engaged. The planet gears are bearing mounted on a carrier which in turn meshes with the drive shaft. The sun, or center gear, of the planetary train turns in a clockwise rotation with the engine so that when the outer ring gear is held tight, planet gears are free to "walk around" rotating the carrier and the drive shaft in the opposite direction. In neutral position, the control valve cuts off the flow of oil under pressure to the piston plates so that both clutches are allowed to run free.

Since none of the parts are transmitting power to the shaft, the shaft does not turn.

Municipally owned Fairfax electric light and power plant houses four Fairbanks-Morse Diesels. Marley cooling tower is seen at left.

FAIRFAX MAKES A DOLLAR GO FAR

By T. J. MALONE

STARTING with a municipally owned electric distribution system, which had delivered purchased energy to the community, the village of Fairfax, Minnesota, decided about twelve years ago to go all out for municipal electric service. It built a power house and installed a two-unit Diesel electric generating plant on what might be called a shoestring.

On credit only, on nothing more than its good name—with no transfer of funds by the village, with no village loan or tax levy, with no money available at all other than current income from the distribution system, itself in debt at the time—the community went into the business of generating light and power. Initial investment in building and equipment amounted to $147,138, all financed on credit. As of December 31, 1946, all had been paid off from earnings of the combined plant except $20,312. Valuation of the distribution system at the beginning of the Diesel period is not included in the foregoing overall investment. The debt on it was met by tax levy and not by earnings of the electric plant. But that isn't all. In addition to the payoffs totaling $128,826, the earnings have enabled the plant to make permanent transfers to the village general fund amounting to $48,000 and to buy a dwelling for the superintendent at a cost of $5,000.

There were still surplus earnings on hand last year, enabling the plant authorities to make a temporary transfer, a loan, of $21,000 to the village to start a municipal liquor store. Incongruous, a hookup between the electric generating plant and a liquor store? Well, the two have this in common: both dispense power and both rely on internal combustion. All these outlays from plant earnings totaled $200,825. Besides, earnings paid interest on the outstanding debt.

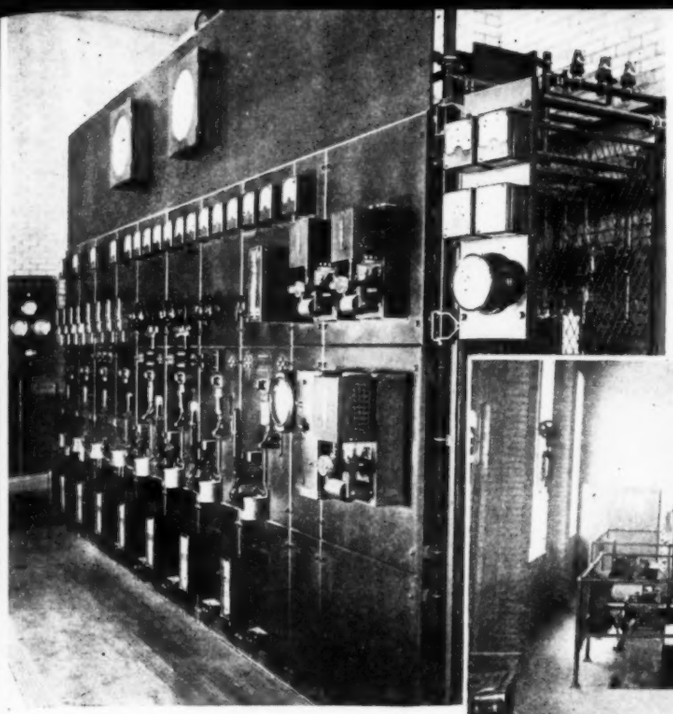
Diesel operation began March, 1935, with a two-cylinder, 140 hp. engine and a four-cylinder, 280 hp. Both, with auxiliary equipment, were installed by Fairbanks, Morse & Co. In 1938 a third Diesel, also a Fairbanks-Morse, was added, of six cylinders, 450 hp. The next year the plant began serving an REA cooperative, its chief customer since. In another year a fourth F-M Diesel was installed, of five cylinders, 875 hp.

The total horsepower had reached 1,745; the rated capacity totaled 1,176 kilowatts, divided 90—186—300—600. In the cooperative's first full year of the tie-up, 1940, it bought 757,540 kilowatt hours of energy, or 43.4 per cent of the plant's entire generation. The next year—calender years are meant—the "co-op" took 1,094,327 KWH, or 51.8 per cent of the total plant output of 2,106,080 KWH. In 1945 the "co-op" took 65.6%.

Generation of the plant in 1945 was 3,477,640 KWH and of that the REA use was 2,196,060. All four engine units were taxed to meet a load that ran to 1,100 kw. as peak. Something had to be done to relieve the plant, and the thing done was to reduce the service to the

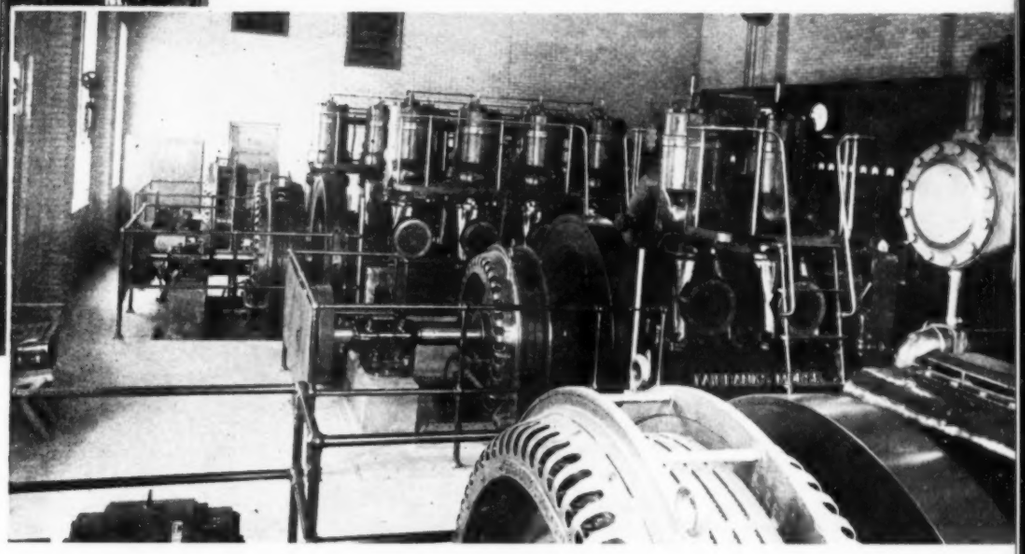
TABLE A

Year	KWH volume generated	Av. gen. cost per KWH	Av. cost del. per KWH gen.	Av. rev. per KWH gen.	KWH per gal of fuel oil	Peak load, KW	Rated KW Cap'y
1939	903,760	$.0116	$.0154	$.0315	10.96	—	576
1941	2,106,080	.0079	.0107	.0210	11.77	660	1,176
1942	2,445,000	.0086	.0103	.0198	12.02	700	1,176
1943	2,896,580	.0079	.0088	.0276	12.63	780	1,176
1944	3,133,060	.0080	.0092	.0178	12.32	800	1,176
1945	3,477,640	.0080	.0086	.0173	12.63	1,000	1,176
1946	2,966,960	.0097	.0104	.0196	12.01	1,000	1,176



Interior view of Fairfax plant showing the complete General Electric switchboard. There are eleven panels including the switching panel.

View of Fairbanks-Morse Diesels in Fairfax plant, capable of developing 1,176 kw. In 1945 Diesels produced energy at a cost of .8 cents per kwh. Engines protected by Nugent and Purolator fuel oil filters, Hilco and Diesel Service Co. "Renuoil" lube oil reclaimers. Air filters by Midwest, intake and exhausts snubbers by Burgess and Fairbanks-Morse. Engines equipped with Woodward governors and Alnor pyrometers.



cooperative, effective in May, 1946. Let it not be thought that the REA business was unprofitable. Last year, 1946, it paid the plant an average of 1.223 cents a kilowatt hour. At that rate it paid nearly $21,000, a tidy part of the plant's operating revenue of $59,376 for the year.

That reduction left the Diesel units an apparent reserve of 476 kilowatts. It is regarded as only temporary relief. The cooperative is expanding rapidly in the area. If the plant would meet that rising demand, it will have to expand too. Growth and performance of the electric plant are indicated in the following table. It begins with the year 1939 as the first full calender year of three-engine operation. Figures are not available for 1936 and 1937, the complete years of two-engine operation. Next comes 1941, as the first full year of four-engine operation. See Table A. The consumer monthly rate schedules observed today are the ones in effect at the time the distribution system switched from utility line to Diesel plant. The village had set them and has seen no reason to change.

Residential consumers pay at this rate: 40 kilowatt hours at 7 cents, 160 at 3 cents, excess at 2 cents. This is for light, cooking and power served through one meter.

For commercial lighting and small power the charge is: $1.00 for the first 14 KWH; then 200 KWH at 6 cents, 300 at 5 cents, 500 at 4 cents and excess at 3 cents.

Charges for power are: first 200 KWH at 5 cents, next 300 at 4 cents, excess at 3 cents.

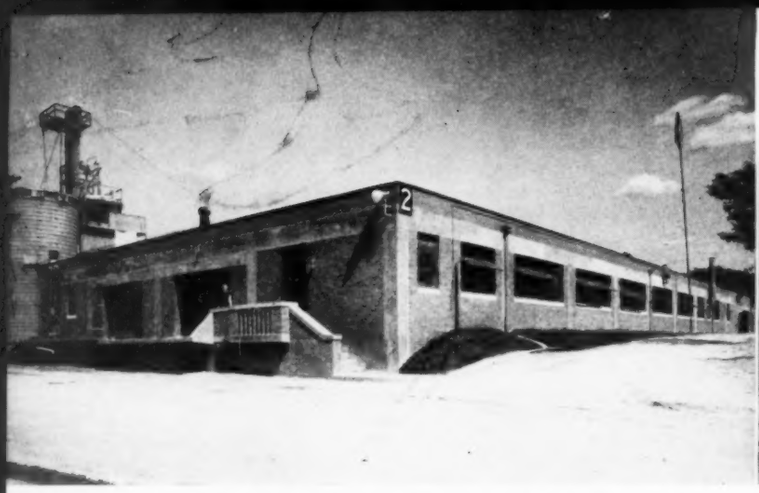
These rates are net, with a 10 per cent penalty for delayed payment. Major industries using power include a creamery, two feed mills, a sugar-beet loading dump. The electric plant does water pumping for the village and street lighting without charge. Their cost is absorbed by the plant and is spread over consumer charges in general. Other "free" services are power to the sewage disposal plant and the fire siren; lighting of village fire hall and office building, public library, community building, pumphouse and ice skating rink; special ornamental street lighting at Christmas. The community building has a kitchen equipped with electric stove, available to groups at a flat charge of one dollar. Such municipal "gift" service amounted last year to 113,701 kilowatt hours.

Residential use totaled 322,029 kilowatt hours; commercial power, 258,247; commercial lighting, 205,806. There were 85 electric stoves and 56 water heaters. Meters served, 542. In the eight years, 1939-1946, revenue more than doubled, with yearly earnings running close to 50 per cent, above and below. This is the tally:

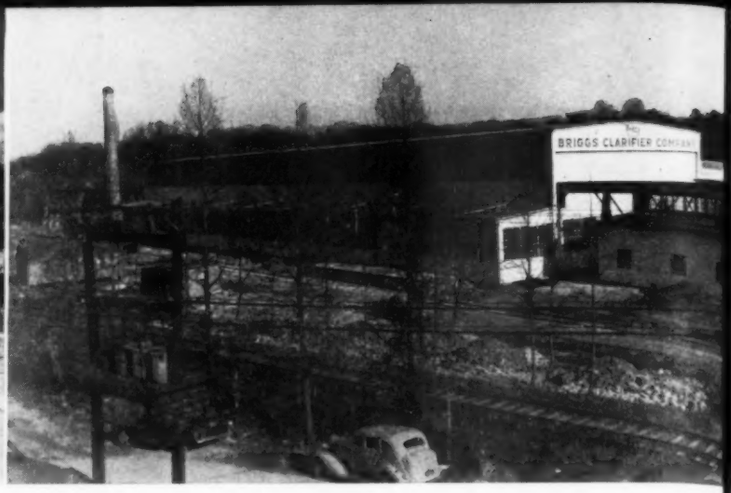
Year	Operating receipts	Operating disbursements	Earnings as % of receipts
1939	$28,493.55	$13,907.34	51.2
1940	39,407.83	18,091.59	54.3
1941	44,265.05	22,531.15	49.0
1942	48,549.37	25,158.03	48.3
1943	52,421.26	25,625.35	51.0
1944	55,711.90	28,939.87	48.1
1945	59,605.14	28,993.32	51.3
1946	59,376.21	31,126.61	47.5

The mayor and the village council of four members direct the electric plant. William Lentz, the mayor, was mayor at the time the generating plant was installed. Council members are Arnold Johnson, Kenneth Dickmeier, Neal Schmelz and A. R. Quast. Mr. Quast is also village recorder. Frank Chesire is plant superintendent. The plant operates the water department also, but as a separate entity.

Fairfax, plotted in 1882, was named by a Virginian for his native country in the Old Dominion. That recalls the Lord Fairfax who was the employer of George Washington in his days of land surveying. There is a link between Fairfax village and the Father of His Country in the tradition that George Washington too could make a dollar go far.



View of Briggs refill plant. Storage silo at left contains fuller's earth.



This is the main plant of the Briggs Filtration Company at Bethesda, Maryland.

A MODERN FILTER FACTORY

By BRUCE C. SISSON

WHAT are they doing to improve Diesel operation? Hundreds of manufacturing concerns throughout the country are contributing their engineering skill and production "know how" to the more economical and efficient operation of Diesel engines.

The Briggs Filtration Company of Bethesda, Maryland, is one of these concerns. It has literally "grown up" with the Diesel engine industry in this country. Back in 1928, Southwick W. Briggs, now Vice President of the company in charge of product development began his experimental work which laid down the groundwork for the establishment of the Briggs Clarifier Company in 1933. Early in his research Mr. Briggs discovered that mere reclaiming of lubricating oil was not economically feasible because of the difficulties in collecting and segregating different types of oil. Therefore he turned his efforts to oil filtration and after exhaustive research and tests developed a combination of cotton waste and fuller's earth, thus utilizing for the first time the principle of dual filtration. The combination of the two types of filter media accomplished a dual purpose. The cotton waste or absorptive medium removed such solid impurities from the oil as carbon, dust and metal particles whereas the fuller's earth or the adsorptive medium removed dissolved impurities such as acids, gums and resins. As time went on, felted cellulose was substituted for cotton waste because of the tendency of cotton to channel and plug up.

The constant improvement of its products is one of the aims of the company. The discovery of a method of bonding fuller's earth into a porous block in a manner which would not impair its adsorptive capacity was one of these improvements.

With the growing acceptance of heavy duty additive oils and adoption by the Navy of these, Mr. Briggs in 1944 conceived the idea of constructing a disc type refill, a series of felted fibre discs stacked together. This type refill was suitable for use with additive oils in that it did not contain the fuller's earth element, which tended to remove the additives from lubricating oil. This type of fluid filtration proved itself so efficient and economical that the postwar development of this "discel" filter was assured.

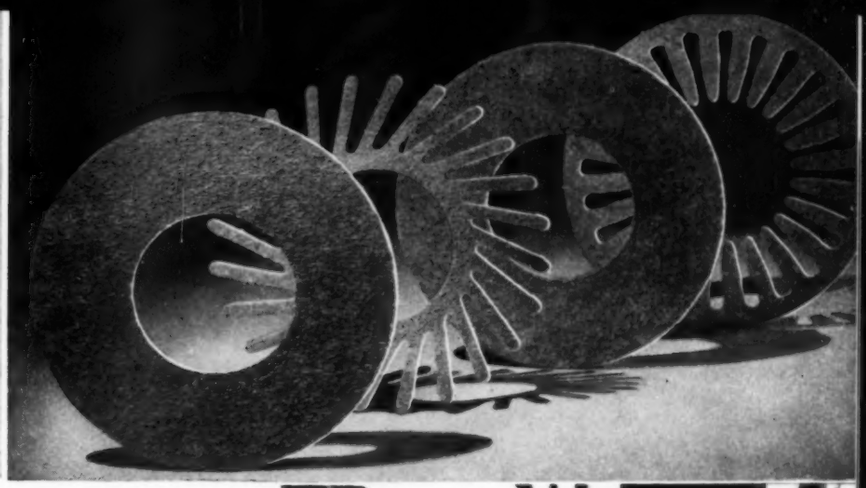
Only recently with the announcement of test results on Diesel locomotives did the latest news of this type filter element become public knowledge. In tests made on a 4-unit freight Diesel locomotive built by General Motors over a period of months and covering an accumulated mileage of over 90,000 miles, these refills averaged 10,000 miles apiece. The company has designed refills and attachments for many of the standard filter types now in use, a measure which should prove acceptable to the great majority of Diesel users in that it will make possible the interchangeability of standard refills and will make for standardization in this important field of Diesel maintenance.

Like many concerns working in the Diesel field, the company expanded greatly during the war and now operates a good-sized plant at Bethesda, Maryland, with over 167,000 square feet of manufacturing space available. The facilities for manufacturing steel parts and tanks for filters are located in the main plant. Refills are manufactured in a separate building erected in 1942 just for that purpose. Another building houses the chemical and mechanical laboratories which contain the latest equipment.

The attitude of the company is one of progressive foresightedness which is clearly revealed in its overall policies. The personnel policies represent some of the best ideas in the employee-management relationship field. The company gives every employee a clear idea of the nature and objectives of its policies. It encourages initiative with its employee suggestion system which offers cash awards for ideas whcih will improve working conditions and efficiency. The Briggs' veteran rehabilitation policy has received nation wide recognition.

Training programs and weekly meetings of employees and supervisors build morale. The result of this farsighted policy has been the rise in the daily output per production worker from $33 in 1941 to over $67 in 1947.

In 1945 the Briggs Clarifier Company was acquired by The Briggs Filtration Company. The company now looks forward to a bright future with Diesel. With a modern manufacturing setup, with a staff of trained chemists and engineers, and with an intelligent and progressive management, the industry can expect valuable contributions toward better Diesel operation in the future, as in the past.



H. T. Moore, head of Briggs Industrial Sales Division.

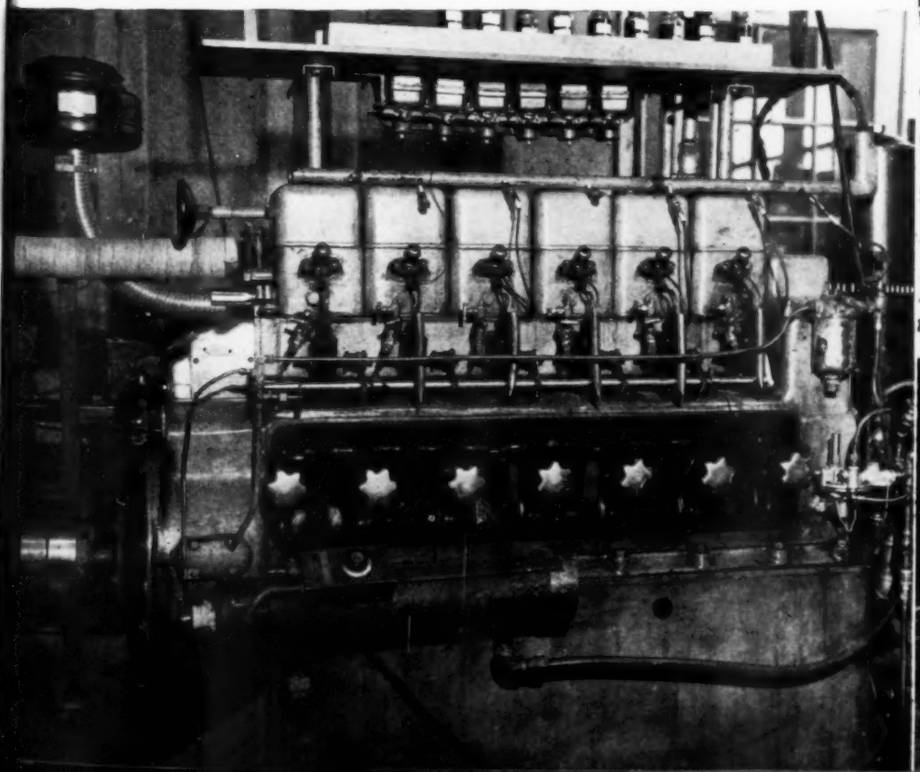
(Upper right) Cellulose discs used in filters, they are stacked together and secured in filter case. Left to right: Filter disc, inlet disc, filter disc, and outlet disc.

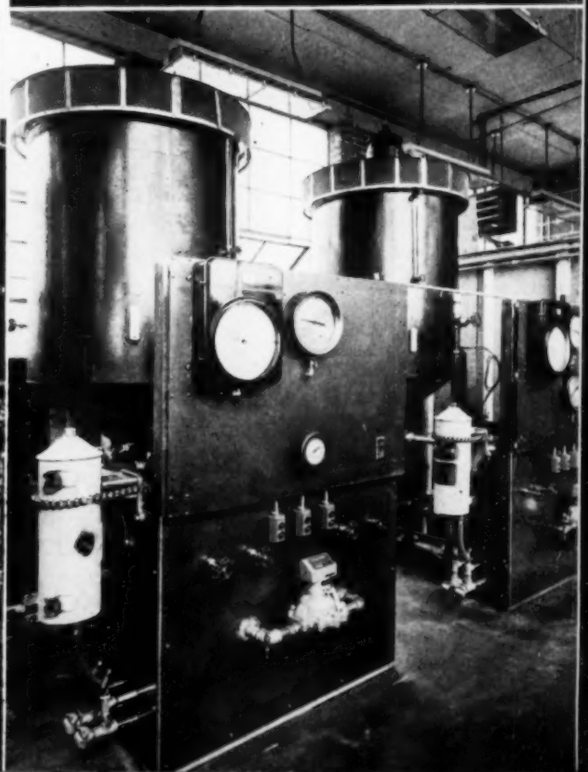
Picture at right shows hydraulically-formed fullers earth cartridge being removed from the press.

(Left) Felted cellulose refill for use with heavy-duty detergent oils. Component parts of this filter are seen in picture top right.

(Bottom right) Modern equipment for refill testing is in continual operation in Briggs mechanical laboratory.

For actual engine test purposes this 60 hp. Fairbanks-Morse Diesel is used.





DURAND. WISCONSIN. UNVEILS NEW DIESEL

By FRANK R. NEU

View of Eau Galle River station of the Wisconsin Hydro-Electric Company. Tile building (left center) houses new Baldwin Diesel.

DURAND, Wisconsin has a new Diesel. The Wisconsin Hydro Electric Company recently installed a new Diesel, a 730 hp. Baldwin, in its Eau Galle River Station. Formerly equipped with two 200 kw. water powered generators, the station which serves Durand will now be able to develop a total of 900 kw. with the addition of the new 500 kw. generating set. Although Durand still requires additional power via transmission lines, the new arrangement will permit the generation of adequate power during peak load periods and during emergencies when incoming power lines are out of commission.

Durand, a thriving town of 20,000 population is dependent primarily on the dairy industry. Located there are a Hercules Powder Company casein plant, a Western Condensery plant and a large creamery. In addition there is a large canning company engaged in canning peas and beans. In Durand and its surrounding territory there are 1476 users of electric power.

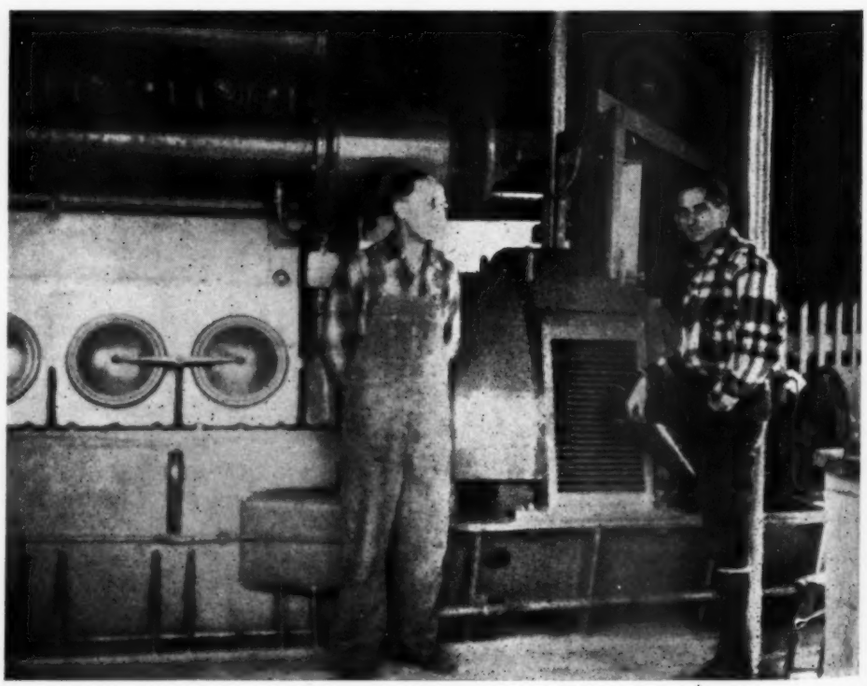
The new Diesel is housed in an especially-built addition to the Eau Galle station. The total cost of the improvement is estimated at over $75,000. The new Diesel develops 730 hp. at 514 rpm. It is 8 cylinder with a bore of 12¾ and a stroke of 15½. It is equipped with a Woodward governor.. A Briggs lube oil filter is installed. A Worthington compressor driven by a General Electric motor supplies starting air. The engine drives a 500 kw. Allis Chalmers generator.

Harrison Boa of Eau Galle is the chief engineer of the plant. The original plant was built in 1913 along with the dam which now supplies a head of water sufficient to drive the two 200 kw. water turbine generators.

Anto Cebe is manager of the Durand branch of the Hydro Electric Company which serves the city of Durand, several villages and a large rural area. The new Diesel will reduce considerably the load placed on the transmission system and furthermore will permit the Durand Branch considerable independence in cases of emergency.

If Durand follows the trend exhibited in other midwest cities and towns it will not be long before another Diesel makes its appearance in the power station. The possibilities of economical power production lend heavily towards the expansion of local industry. It has happened many times before under like conditions in many other places.

Harrison Boa, chief engineer, and Anton Cebe (right), Durand Branch Manager appraise the new Baldwin Diesel installed at the Eau Galle plant.



DIESEL LOCOMOTIVES FOR TURKISH MINES

by WILL H. FULLERTON

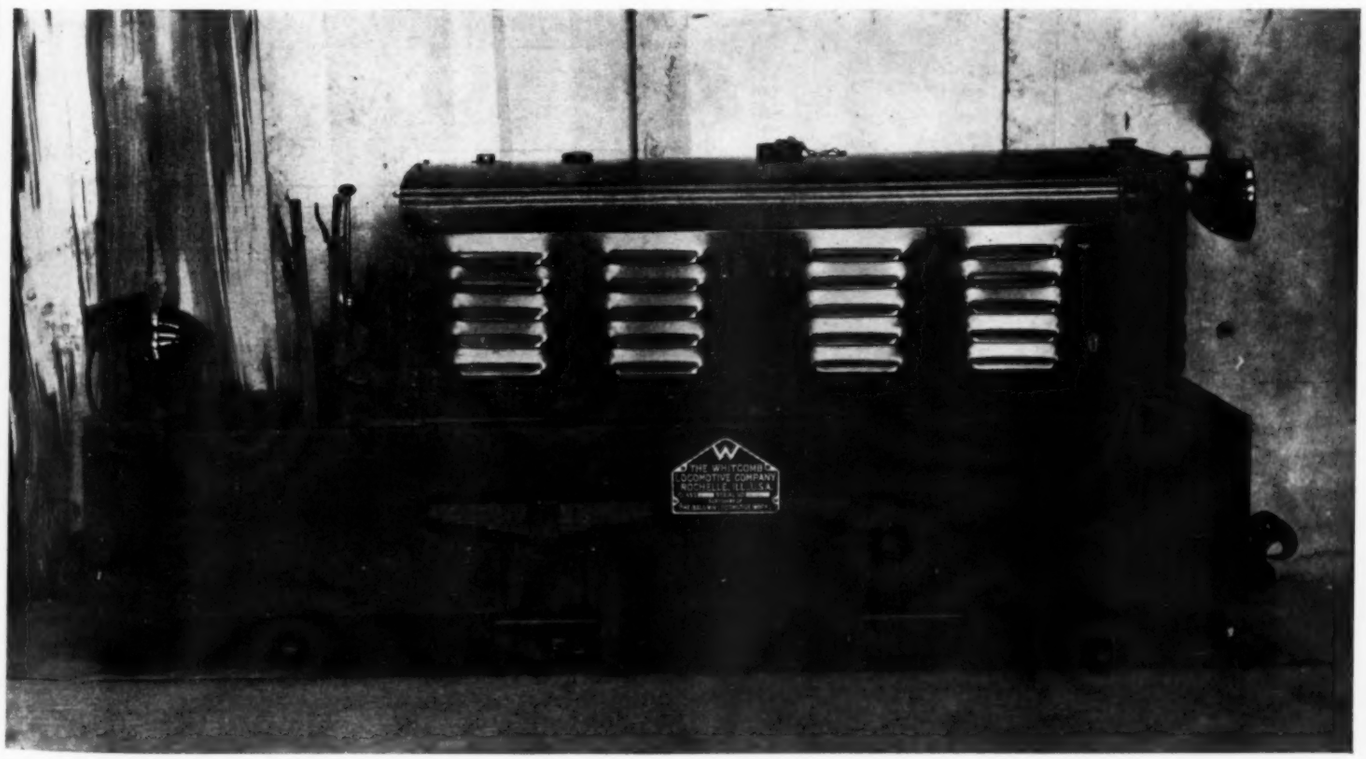
A RECENT locomotive application of more than ordinary interest was a shipment of fifteen 7-ton Diesel mechanical mine model locomotives destined for use in the Eregli bituminous coal mines of Turkey. They were purchased by the Turkish Purchasing Commission for shipment to Ankara, Turkey. These small but powerful Whitcomb locomotives are narrow gauge (23 5/8") 0-4-0 type and are powered by Buda Diesel engines, nominally rated at 35 hp. at 1800 rpm.

The usual types of locomotives used in coal mines in this country are either the electric trolley or electric storage battery type. Electric storage battery locomotives are used almost exclusively in gaseous mines and these locomotives must be of the permissible type, explosive proof and must be granted a "Permissability Plate" by the U. S. Bureau of Mines. The presence of high percentages of explosive gases in bituminous coal mines here have limited the use of internal combustion locomotives for underground service because of the danger of explosion. It is an established fact, however, that the Diesel locomotive is lower in first cost and is far more economical to maintain and operate. Diesel locomotives are practically standard equipment for coal mines and metal mines in Continental Europe. As the methane (explosive gas) content of the air within these particular Turkish mines is only between 2% to 3% (not considered especially dangerous) it was necessary only to route the exhaust through a water muffler which eliminated the possibility of the engine back firing and the accompanying dangers of sparks and resulting explosions.

The speed of these locomotives were not as important as the need for high tractive effort at low speeds. While the locomotives were geared to operate at a maximum speed of 15 mph., they seldom travel faster than 6 mph., and will be able to negotiate a 1% grade with a trailing load of 44 tons at 3.7 mph. in second speed.

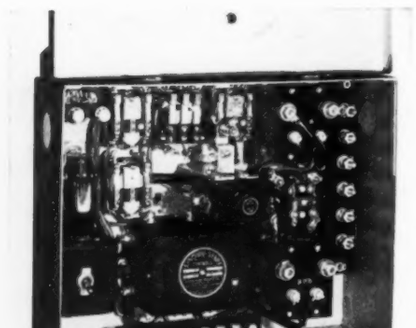
The locomotives are 10 ft. long, 3 ft. wide and 4 ft. 6 inches high. Maximum tractive effort 33 1/3% adhesion, dry sanded rail is 3,800 lbs. in low gear. Spare parts including 5 Buda Diesels for replacement purposes went forward with this shipment as it was specified in the original order that these 15 locomotives would be expected to work 24 hours every day for 3 years. It is expected that these Whitcomb locomotives will be more than satisfactory.

Seven ton Whitcomb mechanical locomotive powered with Buda Diesel engine. Fifteen of these locomotives were recently shipped to Turkey for use in coal mines.



ELECTRONIC CONTROLS FOR FARM DIESELS

By F. RANKIN WEISGERBER*



Synchro-start control unit with cover raised to show compact arrangement of elements for starting and stopping and full automatic protection of the engine.

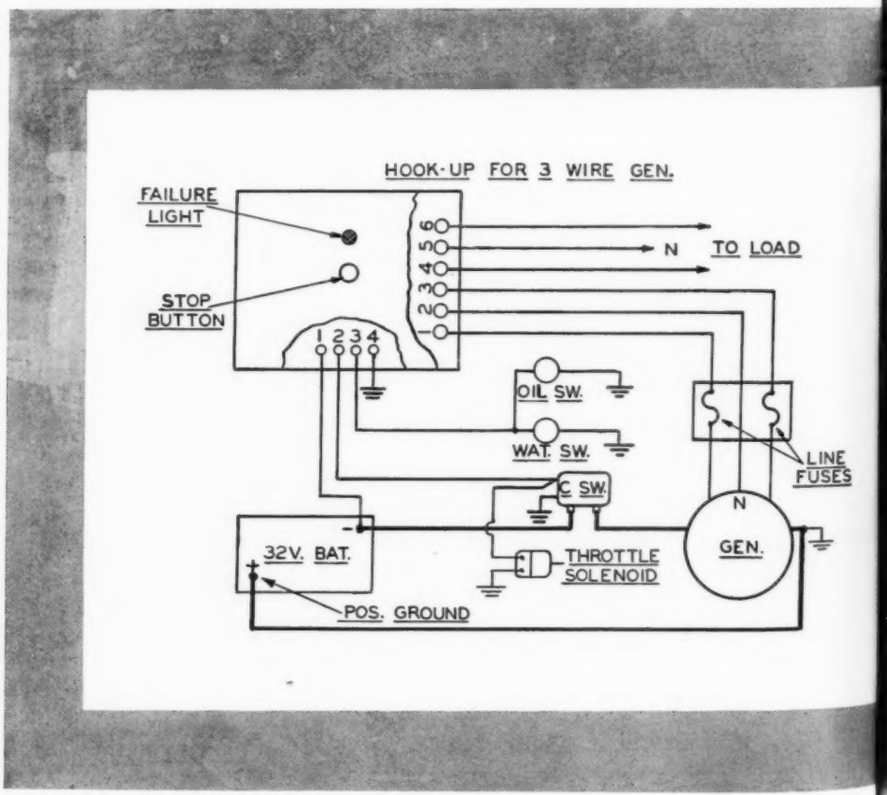
THERE has been a long felt need for a dependable, fully automatic control for Diesel generating sets. The Rural Electrification Administration has done an excellent job of bringing central electric power to the many farm and ranch homes. However, there are still a large number of districts for which this power is not available. It was with the farm homes, rural and other potential power users in mind that Lister-Blackstone wished to develop a plant that would have all the advantages of a central power station.

In order to retain these advantages, it was necessary to develop a system whereby an engine would automatically stop and start with load demand; and consequently, not require the Diesel plant to be in continuous operation. A fully automatic operation had to include equipment:

1. To turn the fuel supply on and off.
2. To crank the engine until starting is accomplished.
3. To disconnect the starting circuit after the cranking period.
4. Limit the cranking period to protect both the controls and engine in the event that starting does not take place within a predetermined period of time.
5. To insure prompt combustion. This may be aided by means of a decompression device or by units such as pre-heaters to introduce added heat to the starting cycle.
6. To shut the engine down in emergencies, such as excessive water temperatures or low oil pressures.

After much experimenting, a control was developed by Synchro-Start engineers which incorporated these features. This control uses an electronic principle for measuring the line loads; thereby eliminating sensitive mechanical relays and providing more positive operation and at the same time incorporating an adjustment to compensate for the line load capacity. With this Synchro-Start control set, the engine is initially started in the conventional manner

Diagram of circuits for full automatic control of a 3-wire generator unit.



* *Executive Vice-President, Lister-Blackstone, Inc.*

by closing any load switch on the A.C. line. Battery current then flows out through this load and back to the set, pulling in a pilot voltage relay which initiates the starting cycle. This pilot relay is locked in through a thermal timing element so that once it closes, it will not re-open until after the engine has started and the electronic tube is operating; hence, once the engine is called upon to start, it will run for about twenty seconds before shutting down, even though the load switch is immediately re-opened. This allows the engine to come up to full speed and get the oil circulating before shutting down.

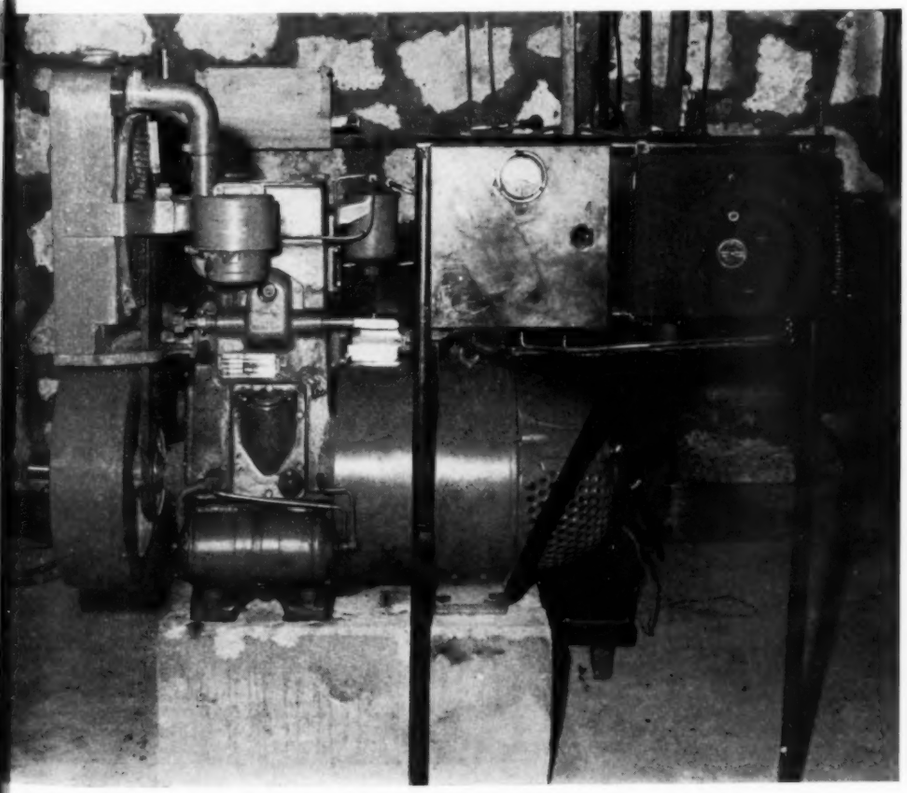
A. A. Baker ranch residence equipped with full automatic Diesel generating unit which runs only when power is demanded by flicking a light switch.

For continuously measuring the line load all the time the engine is operating, a gaseous discharge tube for the Thyratron type is used. The cathode heater of this tube is only energized while the engine is cranking or running and the A.C. for the place circuit is furnished by the alternator. The type of Thyratron tube used contains two grids; one a shield grid upon which is imposed a constant D.C. voltage, and a control grid connected to the secondary of a series transformer in the line circuit so that its voltage varies directly with the load on the line. The shield grid voltage is adjusted by means of a potentiometer, such that it requires a line load of 50 watts or more to produce enough voltage on the control grid to overcome the shield grid effect and cause the tube to conduct or "fire." When the tube fires, it pulls down a control relay to keep the engine running and unlocks the pilot relay. As long as the line remains above 50 watts, the tube will continue to fire and keep the engine running, but when the load drops below that value, it will stop firing and the engine will stop.

By adjusting the potentiometer, the shield grid voltage may be changed slightly to compensate for small line leakages or capacity effects and still have the plant operate on a 50 watt load.

A time limit of cranking is provided to protect the battery and cranking winding in case the engine refuses to start, and low oil pressure and excessive water temperature safety stop provision with indicating signal is included. Any feed-back between the A.C. circuit and the battery is definitely prevented by means of interlocking contacts on the main line contactor. A selector switch in the cabinet provides a manual position in which the engine will operate continuously in spite of frequent on and off or highly variable loads. A safety switch in the cover will stop the engine in emergencies or prevent it from starting when it is desired to keep it out of service.

Lister-Blackstone Diesel generator set at A. A. Baker Ranch, Comstock, Texas.

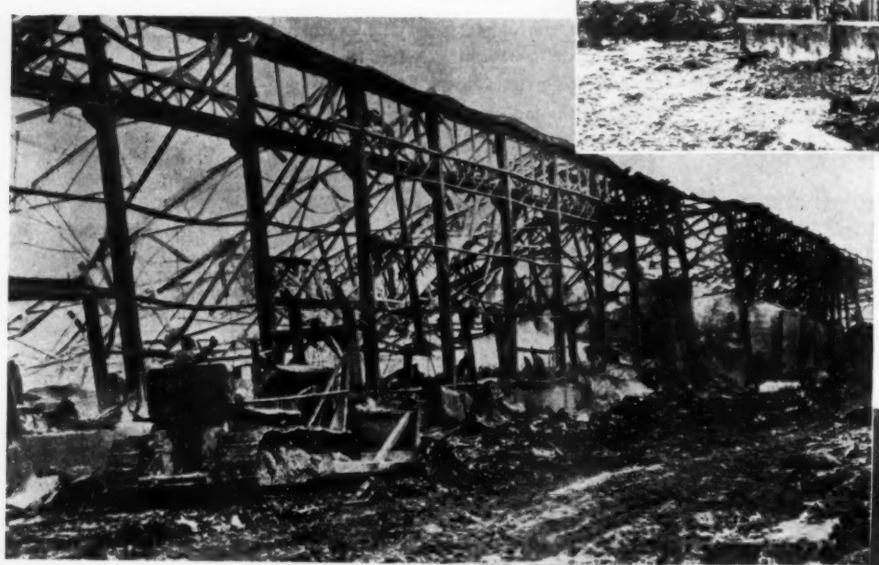


A low voltage relay is provided for operating the line contactor, thereby preventing damage to line equipment because of under voltage. All relays and electronic elements, as well as the transformers and line contactors, are enclosed in a steel cabinet equipped with knockouts for conduit wiring. Terminals are provided for the connection of all engine accessories, as well as the alternator and load leads to simplify the installation. Once the unit is installed, the controls should require no servicing or adjustment outside of replacing the Thyratron tube. The life of this tube is ordinarily about a year.

While the full automatic set has all the advantages of a central power station, it also is economical. A typical example of economy is the unit installed at the A. A. Baker ranch residence by F. Earl Wilson, San Angelo, Texas. Over a six month period this 4½ kw., full automatic Diesel generator set furnished 1200 kilowatt hours of power consuming 204 gallons of fuel oil, 2½ gallons of lubricating oil, including one oil change for a total cost of $18.08, or $0.01½ per kilowatt hour. Controls of this type have been developed for Lister-Blackstone Diesel generator sets in sizes ranging from 2 kw. to 9 kw.

DIESELS AID IN TEXAS CITY DISASTER

As disaster struck Texas City—smoke and flame shoot upward from the Monsanto Chemical Company plant.

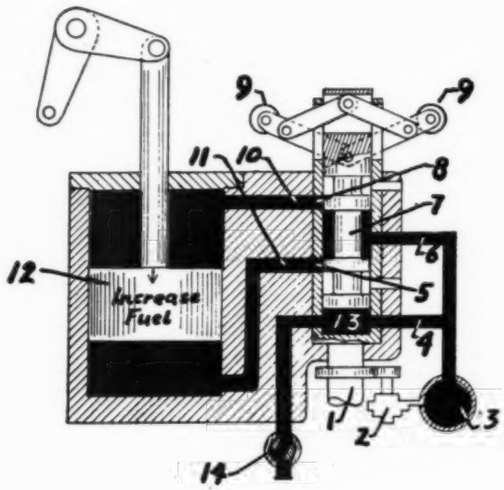


(Above) Bulldozer-equipped "Caterpillar" Diesel tractor clears debris to expedite rescue work. (Left) "Caterpillar" Diesel with Le Tourneau bulldozer clears path along wrecked Texas City dock. (Below) Grain elevator towers amidst twisted wreckage in industrial area.

Photographs by Press Association, Inc., and Acme, Inc.

(Below) "Caterpillar" Diesel tractor equipped with crane raises wrecked car from wreckage.

NEW TYPE GOVERNOR FEATURES AUTOMATIC COMPENSATION

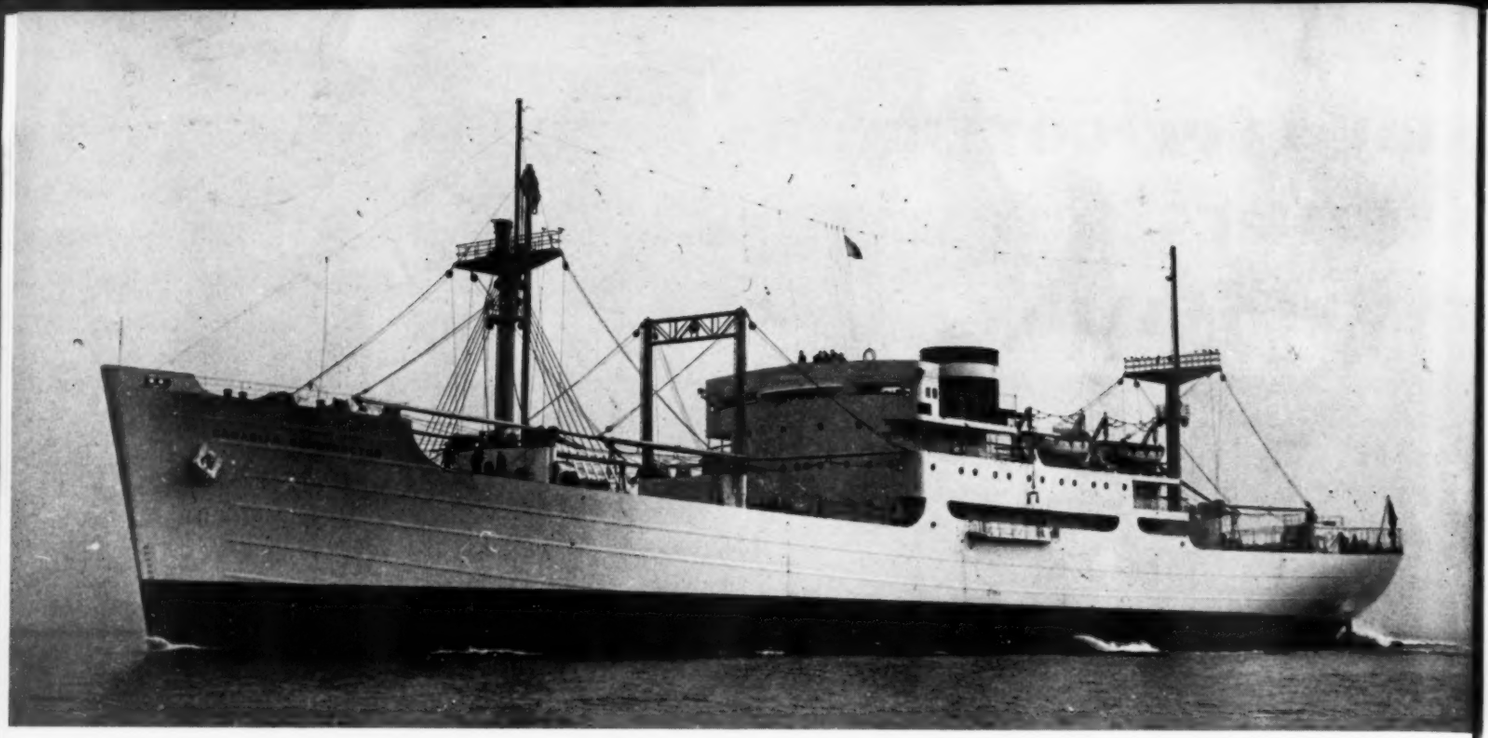


Schematic diagram of Massey auto-compensating governor. (Right) View of new governor of 4 dial type.

A RECENT addition in the field of isochronous governors is the new Massey hydraulic governor which includes an interesting and effective compensation device which is said to eliminate any tendency on the part of the governor to hunt or overshoot. This close control is accomplished hydraulically through the use of a small reversible pump and a accumulator which supply hydraulic fluid to the power piston in quick short seeps as the governor shaft revolves. This hydraulic speeder chamber, as it is called, takes the place of mechanical equipment which would otherwise be needed such as springs and needle valves. Engine shut down for failure of the governor oil pressure is an inherent feature of the design. If the pump fails, oil pressure in the speeder chamber begins to go down so that the pilot moves downward and allows accumulator pressure to move the power piston to "no fuel" position. Speed droop is adjustable from isochronous up to 10% while the governor is running. The speed droop operates an outlet from the speeder chamber so that the speed setting is reduced as the power piston moves downward toward full load. Load limit is adjustable from zero to full load while the governor is running. The load limit pushes the pilot valve to neutral as the power piston comes to a stop.

By referring to the schematic diagram on this page, the action of the governor is noted. (1) is the governor shaft to which are attached the flyweights (9) for operating the pilot valve (7). (2) is a reversible pump driven by shaft (1) to charge accumulator (3) for supplying the hydraulic power line (6) and the hydraulic speeder line (4). The power line (6) serves line (10) to move power piston (12) downward toward increased fuel if the pilot valve (7) moves up due to the weights (9) going inward. The same line (6) serves line (11) to move power piston (12) upward toward decreased fuel if the pilot valve (7) moves down due to the weights going outward. Shaft (1) has only one outlet hole in its circumference at (8) and only one outlet hole in its circumference at (5) so that when pilot (7) is open either up or down, pressure from (6) is delivered to the power piston (12) only once per revolution when the holes pass (10) and (11). This provides the compensation or stopping action for power piston (12). Line (4) serves speeder chamber (13) which furnishes upward pressure on pilot (7) to oppose the centrifugal force of the flyweight tending to move pilot (7) downward. The pressure setting in speeder chamber (13) is the speed setting of the governor and is adjusted by the outlet valve (14) from the speeder chamber.

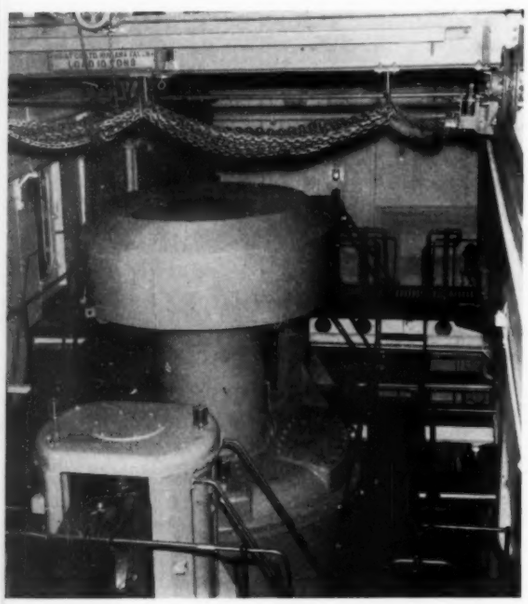
The governor as shown in the diagram is in neutral position with the hydraulic force in the speeder chamber just balancing the centrifugal force. If a load comes on the engine it tends to slow down which decreases the centrifugal force so that the speeder chamber force is then greater and moves the pilot upward. Oil from power line (6) then enters line (10) and moves power piston (12) down to increase the fuel. The auto compensation feature is inherent in the movement of the power piston which consists of short quick steps as a result of the compensating stopping action when hole (8) is not passing line (10). It likewise automatically provides secondary compensation because the pilot valve can not overshoot in the opposite direction.



"CANADIAN CONSTRUCTOR"

By DOUGLAS SHEARING

View of upper level of "Canadian Constructor's" engine room showing top of Sun Doxford Diesel which develops 6,000 hp. in four cylinders of opposed piston design.



THE *Canadian Constructor* is one of the first post-war ships to be built in Canada for the Merchant Marine. She is one of three sister ships, all passenger carrying cargo vessels, being completed for the Canada-West Indies service of the Canadian National Steamships and, purchased from the War Assets Corporation. The *Canadian Constructor* was built at the Burrard Drydock Company at North Vancouver, B.C., and is now enroute to the east coast, under the command of Capt. D. C. Wallace, D.S.O., O.B.E. The *Canadian Cruiser* was built by Canadian Vickers Limited at Montreal, and the *Canadian Challenger* was built by the Davie Shipbuilding Company at Quebec.

The three vessels are 436 feet long, overall; 59 feet, beam; 25 feet, load draft; and 7,500 tons deadweight. Their speed is 16 knots. They have 16,000 cubic feet of refrigerated space for carrying perishables, divided into three chambers so that the temperatures may be varied to handle various commodities. In addition, they have 370,000 cubic feet of general cargo space separated into five holds. Electrically driven winches load and unload the cargo.

The new ships have accommodation for 12 passengers, five two-berth and two single rooms. All are air-conditioned and are equipped with shower baths, toilet and hot and cold running water and the latest in comfortable furnishings. Similarly, the space allocated to the officers and crew in the deckhouse amidships will also be well fitted and insulated.

The three all-Canadian built boats are powered by the largest set of Diesel engines ever built in Canada. All three were constructed by Vickers. They are 6,000 hp. Sun-Doxford Diesel Marine engines of four-cylinder design. A new feature, unique in so large an engine, is the Maxim combined waste heat recovery silencer. It is designed to run in the dry condition acting as a silencer only when the steam output is not required from the boiler portion. Designed to burn oil with as low as 14 Beaume gravity if necessary, the engine is expected to operate at a rate of .34 pounds per bhp., or .38 pounds for all purposes, which is 26.8 long tons per day at full power. This contrasts with the 40 tons per day consumption at full power of similar ships equipped with steam turbines and indicates economical operation.

All equipment on the *Canadian Constructor* is classed to Lloyd's, British Corporation, and Canadian Steamship Inspection requirements. Fresh water supply is augmented by a salt-water evaporator and distiller. A Richaudio smoke detection and Kidde fire extinguishing system is fitted in holds and engine room.

Navigation equipment is most modern with a Sperry gyro compass and gyro pilot steering, electrical depth indicator, Kelvite dry cargo compass, rudder indicator and electrical echo-sounding depth indicator.

The *Canadian Constructor* makes history by being the largest yet built in a British Columbia yard. Her tonnage is 7,500 gross or 11,370 displaced weight, as compared to the 10,000-ton "Park" ships which were turned out in large volume by the yards in British Columbia during the war.

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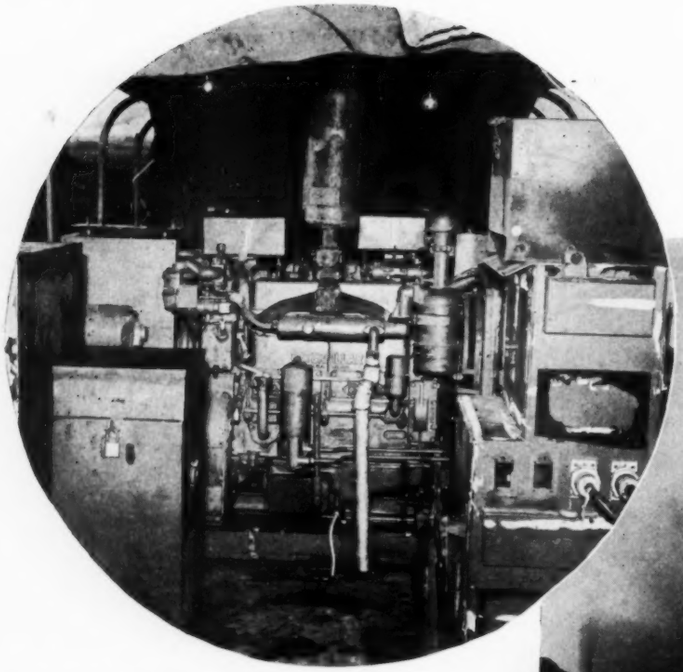
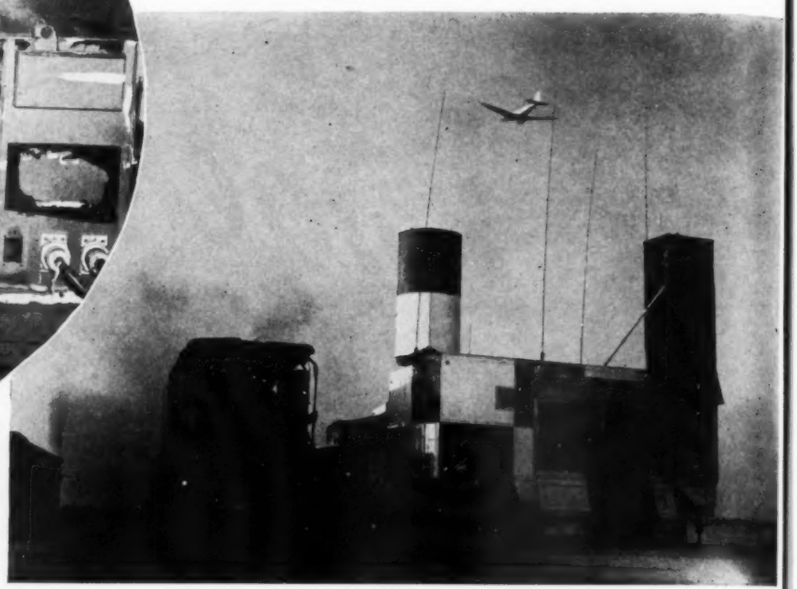
DIESELS AID AIR SAFETY





(Above) One of two Caterpillar Diesel-electric generators, trailer mounted, which power GCA equipment. (Right) GCA unit at U. S. Naval Air Station, Oakland, Cal. Power trailer is seen at left, silhouetted.

As World War II drew to a close, a new device (an adaptation of radar) eliminated one of flying's chief hazards—the problem of blind landing. Called GCA (Ground Control Approach), this highly technical radar apparatus safely landed returning bomber missions at their fog-bound and blacked-out airfields—averaging one every three minutes.

Naval Air Transport pilots at NAS Oakland and Moffett Field, California, where the mobile units are in constant operation, say that GCA provides the most simple of all instrument landing procedures. Given a 50-foot ceiling and ¼ mile visibility, GCA can break a plane out into the open, over the end of the runway to a safe landing.

Briefly, this is how a team of ground operators can bring a plane down a ten-mile stretch of the worst possible weather to a safe landing: A pilot, stuck in the middle of solid masses of stratus and fog, calls the tower nearest his position and requests a GCA approach. He needs no special equipment in his plane to follow GCA—only a standard two-way radio is necessary.

The tower checks to see what frequencies he can transmit and receive on and tells him which to use. Then he is cleared from the tower frequency to that of the GCA unit. Contacting the GCA he is asked for his altitude, heading and approximate position and then given the radio frequency of the nearest radio station, radar beacon station or range station (whichever he happens to be nearest) and he is told to report when over the station.

When the pilot reports, his plane is spotted by the GCA on the radar scope and he is given a new heading to fly. He is then in "contact" and the scope readers steer him over and into a downwind heading, then into the crosswind leg of the approach, dropping him down all the way.

Five to eight miles out, the GCA's final controller, with two men to help him, uses precision radar to track the plane in all the way on that approach. This radar can indicate the exact position of the plane within 5 feet in elevation and 5 feet in horizontal deviation. A mechanical setup interprets what the radar shows and a moving "blip" of the plane indicates to the final controller any change of heading or rate of descent relative to the glide path on the final approach. By constant reference to this moving miniature of the plane, he can "talk" down the pilot and can tell him if he is so much as 5 feet off course in any direction.

The GCA units at NAS Oakland and Moffett Field consist of three parts: a prime mover, a trailer and another truck, the size of the prime mover, to carry spare parts and handle equipment maintenance. Within the body of the prime mover are two "Caterpillar" Diesel Electric Sets to power the radar gear, which is located in the trailer along with an air conditioning system that ventilates the control room. The three parts of the unit are completely mobile and self-contained and they can be moved easily from place to place. Shifts can be made from one runway to another and the unit placed in operation in less than 30 minutes.

Breaking the sides of the smooth trailer are three radar antennae. Directly on top is a plan position indicator antenna which revolves at the rate of 30 times a minute, sweeping an area up to 30 miles. On the left side of the trailer, facing out from the side, are the two precision radar antennae. The azimuth tracker is mounted horizontally while the elevation tracker is mounted vertically. Neither of these antennae revolves.

These two radar antennae represent two separate radar sets—one for long range scanning, the other for close-up screening during the final leg. Duplicate sets as standbys are in each trailer for immediate operation. Six radio transmitters and receivers are available in the trailer, three VHF and three HF. They are all push button type for immediate control of frequencies.

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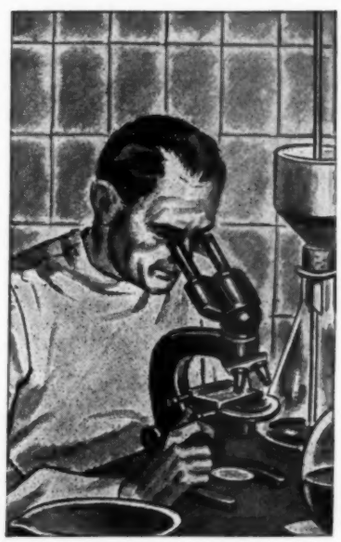

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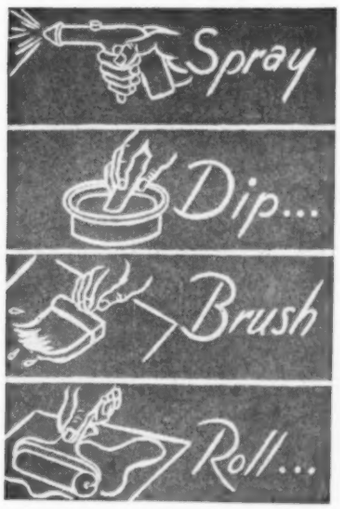

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Conducted by R. L. GREGORY*

"UNIT INSTALLATION AND ITS EFFECT ON DAILY OPERATING PROBLEMS" PART 4

IN last month's article we had reached the point of finishing the preliminary leveling of the bedplate for a new Diesel unit, we will now consider the final leveling of the bedplate. Before this can be accomplished, however, it is necessary to install the foundation bolts and grout them in, so that the bedplate can be pulled down firmly on the leveling blocks, and any correction necessary can be made.

On this particular unit twenty-two foundation bolts are used, eleven to a side. These bolts are 2¾" in diameter and 12 feet long, weighing approximately 250 lbs. each. The lower end of each bolt is threaded and a 2¾" hexagon nut installed, while the upper end is also threaded and has a 2¾" octagon nut which when in place sets on a steel washer on the top of the bedplate. Since these bolts are hard to handle and must be lowered in a vertical position, a handy method of handling them was used. The erector had a "U" made, out of ⅝" cold roll and welded each end of the "U" to opposite sides of one of the octagon nuts. This was merely spotwelded enough to carry the weight of the foundation bolt.

When all was in readiness, this nut was installed on the upper end of the foundation bolt, the bolt was then picked up with the crane and carried directly over the hole in the bedplate, where it was to be installed. The bolt was then carefully lowered through the bedplate until the lower end just protruded through the bedplate. It was held in this position, until a hex nut could be installed on the lower end, then the bolt was lowered into the foundation until about 5 inches of it remained above the bedplate. By using a 36 inch stilson wrench, the foundation bolt was then held while the octagon nut with the "U" was removed and another screwed on until just a full nut was attained. The foundation bolt was then lowered about ½" into position.

This process was carried on until all twenty-two bolts were in place and when the final bolt was in position, the "U" was chipped off the last octagon nut, and the spotweld filed off to give the side a smooth surface. With these bolts in place, they were grouted in with the proper mixture of grout and the grout allowed to set for several hours before any pressure was applied in the way of tightening the nuts.

After the bolts were firmly grouted and set in the bolt pockets of the foundation, the bedplate was pulled down firmly on the leveling blocks by tightening the nuts. This process of tightening down the foundation bolts, loosening them up and inserting or taking out of shims, was carried on several times, before the final leveling was completed. The level of the base was checked and rechecked after each adjustment, both lengthwise and crosswise at each bearing position and when finally completed, the bedplate was as nearly level as it was humanly possible to set it, with approximately the same amount of strain on each bolt.

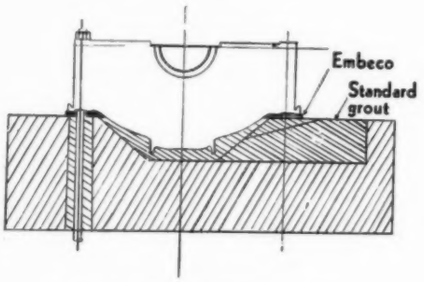


Figure 1. Bedplate grouting diagram.

The next operation was the final grouting in of the bedplate and in this particular instance, standard grout was used and topped with 2" of Embeco, as shown in figure 1. For those not familiar with the use of Embeco, be it said that it is an ideal grouting material for this type of work, since instead of shrinking as it sets up, as most standard grout does, it has a tendency to expand. This feature gives you practically a one hundred percent surface, whereas with standard grout, if you have ever removed an old bedplate or unit grouted with standard grout, you have noticed that in many instances there would be less than 75 percent of bearing surface on the grout, due to shrinkage.

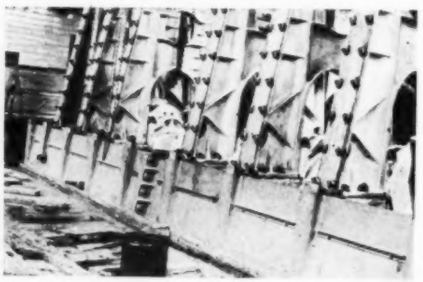


Figure 2. Installation of A-frames of Nordberg Diesel.

After final grouting of the unit, the next step in erecting was the cleaning of the crank and crankcase. The crankshaft which was shipped in the bedplate, resting in the main bearings was not removed. However it was well inspected, and all exposed surfaces well cleaned. Each of the nine journals to which the connecting rods fasten were thoroughly inspected for burrs or nicked places and if any were found were honed out. When all cleaned up the connecting rod bearings were installed, and the connecting rod bolts given a preliminary tightening. Each bearing as installed was given about a pint of heavy cylinder oil on the bearing face and when installed was protected from any foreign particles by winding several strands of candle wicking on the journal next to the bearing sides.

The reason for installing the connecting rod bearings at this point was because of the easy accessibility to the crank at this time. The connecting rod bearings being of the split type, were picked up with two pieces of 1¼" galvanized pipe, about six feet long, passed through the connecting rod holes. The two halves of the bearing were then spread apart on these pipes, lifted with the crane, and with the particular journal on which the bearing was to be installed in top crank position, the bearing was lowered to the journal and the two halves shoved together, and two connecting rod bolts put in place and drawn up. Then the two pipes were removed and the other two connecting rod bolts installed and pulled up.

. . . . *And now please turn to page 72* . . . .

* *Chief Engineer, Municipal Water and Light Plant, Hillsdale, Michigan.*

STANDARD ENGINEERS NOTEBOOK

Inhibitor prevents foaming of gear lubricant

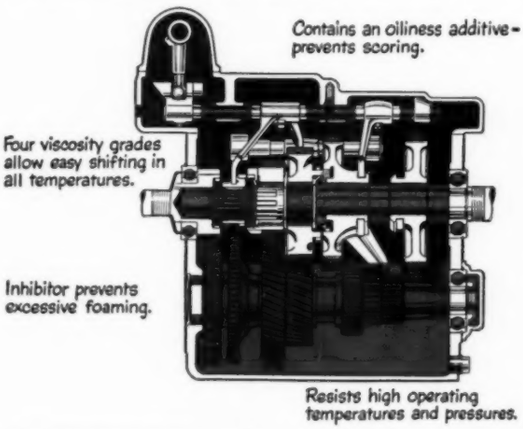
The foaming and expansion of lubricant in transmission and conventional differentials has been eliminated for many operators by the use of RPM Gear Lubricant (Compounded). It contains a highly effective foam inhibitor which prevents retention of air in the lubricant.

Other compounds in RPM Gear Lubricant help it resist high operating temperatures and pressures, dissipate heat rapidly and keep a tough lubricating film on gear teeth at all times.

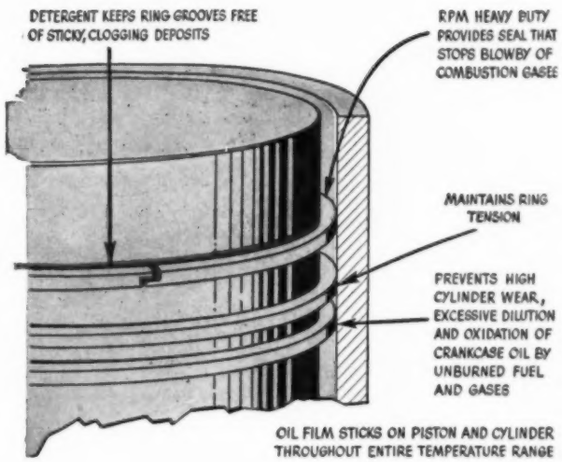
RPM Gear Lubricant (Compounded) will not form deposits in gear cases and is non-corrosive.

It comes in four grades: SAE 80, 90, 140, 250 and is recommended for all automotive transmissions and all differentials (except hypoids) where compounded gear lubricant is specified. (RPM Multi-Service Gear Lubricant should be used in hypoid differentials.)

RPM Gear Lubricant (Compounded) is recommended for most enclosed gears except hypoids.



This drawing prepared with cooperation of Michigan Power Shovel Co.



Heavy-duty motor oil reduces cylinder wear

Many operators have eliminated stuck rings, blowby and excessive cylinder wear by using RPM Heavy Duty Motor Oil.

This special heavy duty oil contains patented additives which remove sticky gum, carbon and lacquer from rings and ring grooves, keeping rings free so they can expand fully. With rings expanded, the tough lubricant film of RPM Heavy Duty Motor Oil forms a seal between rings and cylinder which prevents the force of combustion from driving gases and fuels down the walls.

RPM Heavy Duty Motor Oil sticks to metal at all operating temperatures. This assures unsurpassed lubrication at all times on surfaces of cylinders, pistons and rings, reducing wear to a minimum.

RPM Heavy Duty Motor Oil will resist sludge formation even in coldest operations, will not foam or corrode bearing metals.

For additional information and the name of your nearest Distributor, write Standard of California, 225 Bush Street, San Francisco 20, Calif.; The California Oil Company, 30 Rockefeller Plaza, New York 20, N. Y.; The California Company, 17th and Stout Streets, Denver 1, Colo.; Standard Oil Company of Texas, El Paso, Texas.

FOR EVERY NEED A STANDARD OF CALIFORNIA JOB-PROVED PRODUCT

Exchange Your Diesel Maintenance Ideas

Conducted by R. L. GREGORY

Editor's Note: In this department we provide a meeting place where Diesel and Gas engine operators may exchange mutually helpful maintenance experiences to keep our engines in top condition. Mr. Gregory edits your material and adds constructive suggestions from his own wide experience. This is your department—mail your contributions direct to DIESEL PROGRESS.

"Emergency Plant Lighting"

One of the important items to be considered around a power plant is an adequate emergency lighting system. This is particularly true in isolated municipal and industrial plants, where one occasionally meets up with plant failure due to electrical, sleet and wind storms. Quite frequently these storms occur during the hours between midnight and morning, when perhaps there is a single unit handling the light local demand. Some plants make provision for such an occurrence by having lights operated from battery sets. These operate off a bank of storage batteries and by merely throwing a switch, they can be immediately put into service. Others, where steam is available use small turbo driven sets that can immediately be put into service, while still other plants use a small gasoline driven unit for emergency service.

However one of the handiest and quickest operated outfit, is to connect up either two, 12 volt storage batteries or four, 6 volt storage batteries and use small flood lights with 24 volt bulbs in places where lights are of value in such an emergency. One of these flood lights should cover the switchboard, another on the operating side of each engine, one around the auxiliaries, etc.

The source of current from these batteries should be supplied to the emergency lights by a small solenoid operated switch, the solenoid being normally held open by being energized from the regular house lighting system. When the lights fail, the solenoid drops down, thus completing the emergency flood light circuit and the emergency lights start to function. This is an inexpensive method of assuring emergency lighting and the only maintenance is to keep the storage batteries filled and charged up. These should be tried out every day by some individual made responsible for their upkeep. Such a system saves time and outage.

Several good flashlights, mounted in convenient places near the units and board are excellent for emergencies. These can be mounted in common automobile steering column clamps and are not to be used except in emergencies. They too should be checked on daily. Nothing is so exasperating as to have plant trouble and be in the dark, having to hunt up a light before trouble can be located and corrected.

"Paint and its Proper Use Around the Plant"

There are many places around a Diesel plant where appearances of equipment can be greatly improved by the use of the proper types of paint. Many pieces of equipment such as mufflers, silencers, exhaust stacks, heat exchangers, etc., give off a lot of heat and are hard to keep neat in appearance unless the proper type of paint is used.

Many plants try to keep up appearances of this equipment by use of ordinary paint, but without success. Apparatus of this kind must be covered with a bitumastic paint or a high heat resisting paint, most of which has an asphalt base. We painted several of our exhaust pipes and silencers about six months ago with a black bitumastic paint, and they look as well today as the day they were finished.

Air ducts and intake pipes can be made to look alive by use of a good aluminum rust proofing paint, and we have found that use of a good machine white paint is an excellent preservative on the inside of air ducts, scavenging headers, etc.

Another great help around a plant is the standard system of painting piping to designate air, water, steam and exhaust lines. This is especially helpful where piping is crowded into a limited space and one wishes to trace out the various lines.

Ten Commandments For Diesel Maintenance

1. *Thou shalt keep thine engine clean and in adjustment that thy life in its company shall be long and that the owner shall increase thy pay.*
2. *Know thine engine and all its parts and functions, else thou shalt be in some unholy spot.*
3. *Be not wise in thine own conceit. Remember the factory instructions and keep them holy, lest repairs be thine undoing.*
4. *Be not loose in thy jaw hinges for no man knoweth all about Diesels. The truly wise absorbeth much knowledge and exceedeth little, and he who so doeth shall gain repute among his fellows and favors among his superiors.*
5. *For all things in this life that thou desireth thou shalt also pay plenty and for the wisdom of experience, no less advice from the multitudes costeth nothing and is usually worth just that.*
6. *In the books thou mayest read what to do and when, but only the voice of experience may tell thee why and how, else thy reading of what and when shall but plague thee with smoke.*
7. *God maketh the earth to rotate endlessly without bearings, or oil, but not thy Diesel.*
8. *Curse not thine engine when it turneth not. Curse rather thine own stupidity.*
9. *Steam engines and gas engines may long turn over though sloppy; a Diesel not so. With gauges and mikes be thou ever busy.*
10. *The eternal eye watcheth universal operations, but thou shalt not rely upon it as to thy Diesel. Thine own vigilance is the price thou payest for thy job.*

Method of Assembling Air Valve

M. L. MONSON of Fosston, Minnesota writes in: "In assembling the air valves on our Diesel engines, we use cup grease to hold the springs in place as shown by the accompanying sketch. This makes it much easier and quicker to put the valve together. The valve with the discs in place is placed on an open top stand as shown; while the top with the valve springs held in place with cup grease is placed over the valve. The two parts are then bolted together and the valve is ready to be placed in engine."

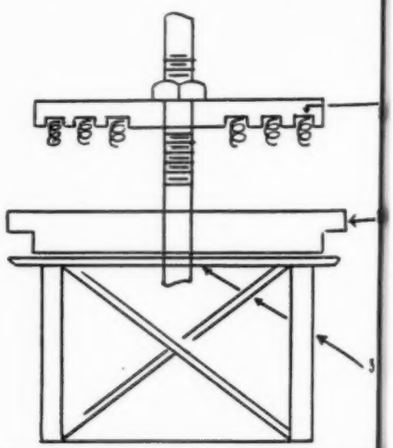


Figure 1. Air valve assembly—1. Cup grease holds spring. 2. Valve with discs in place. 3. Valve stand is drilled for bolt.

Stellar power performance by ENTERPRISE

ENTERPRISE *Diesels*

ENTERPRISE ENGINE & FOUNDRY CO.
18TH AND FLORIDA STREETS
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WASHINGTON, D. C. • ST. LOUIS

SALT LAKE CITY • MIAMI • BOSTON

NEW ORLEANS

Sometime during the coming months the big eye perched on Palomar Mountain will open for its first glimpse into space. This mammoth 200 inch telescope—the largest in the world—depends on three ENTERPRISE Diesel-driven generating units for its complete power requirements. Over 300 miles of wiring inside Palomar's dome carry current to the delicate rotating mechanism, scores of robot controls, intricate lighting, pumping, clock and air-conditioning systems.

Where power failure at any time would stall and impair critical observations, much study of power applications was made by Palomar's great engineers and scientists. The selection of ENTERPRISE Diesels is indeed high testimony of the dependability and reliability of this power for such an exacting assignment.

You too will find in ENTERPRISE Diesels a flexibility of application to meet your special power requirements. We invite your investigation of the wide range of ENTERPRISE Models. Normally-aspirated or turbocharged up to 1800 HP per unit.

DIESEL ENGINES • PROCESS MACHINERY • OIL BURNERS • HEAVY MACHINERY

Supervising Section—

. . . . *Continued from page 68* . . .

The crank was then rotated, and the proces repeated until all bearings were in place. Th next step was the installation of the "A frames which are shown being placed i Figure 2. Note the chain supporting the "A frame being installed by use of the crane Before these were installed, they were thor oughly inspected and any burrs discovered were removed by draw filing. Before an "A frame was installed, the bedplate position where it was installed was given a good coat of glyptal, which was allowed to dry. Then a second coat of glyptal was applied and the "A" frame immediately set in place and drawn down with the bolts. This made perfectly tight joint and leakproof.

With the "A" frames all in place the next step was the installation of the crosshead slides.

Since these slides must be perfectly fitted as to position with relation to the crossheads they are installed in position by means of eight drive fit bolts in each one, which bolts act as dowels, four such bolts being used to a side, the balance of the bolts used are not drive fit.

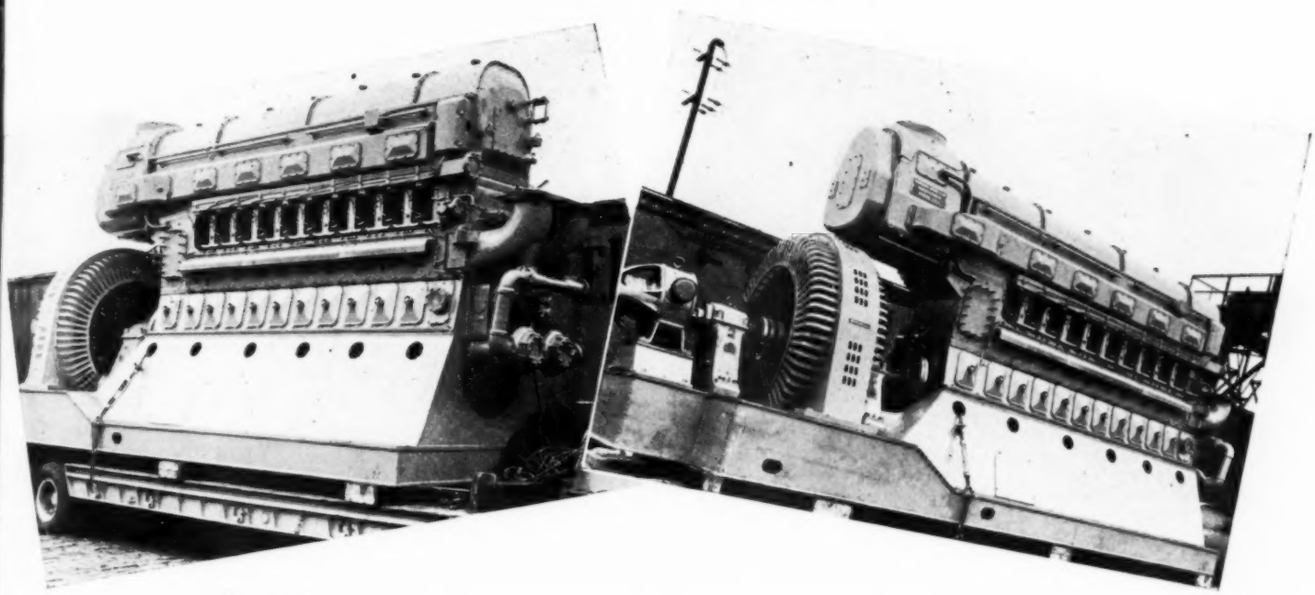
Plenty of time and care was taken in assembly of the foregoing parts, since true alignment and proper setting of these parts all go toward making a smoother and better operating engine, and all have their effects upon daily operation of the unit.

While part of the crew was busy with this work, other members were busy installing the lube oil sump, which is fastened to the lower part of the crank case at the far end of the unit. Here too care must be taken to see that all joints are tight and leakproof, so that the lube oil will be kept within the confines of the sump, and not allowed to seep out through faulty joints.

More on Centrifugal Oil Reclamation

OUR June issue carried the first of a series of two articles on The Centrifuge and Oil Conditioning. This first article discussed the system of centrifugal oil reclamation as developed by The Sharples Corporation. The second article of this series is now being worked up in collaboration with The DeLaval Separator Company presenting, in detail, its system which embodies interesting refinements introduced within the past year. Part II will appear in our August issue.—The Editor

ENGINEERED
AGSCO
DIESEL POWER



Another

AGSCO DIESEL GENERATOR SET

which is shown after shipment from our plant No. 2 in Jersey City. The unit pictured is a 1250 KVA Westinghouse generator, direct connected to a 1600 H.P. Fairbanks-Morse Diesel Engine.

We maintain a perpetual stock of many fine, late-type Diesel Engine Generator Sets. Among the large capacity units in our inventory we offer the following:

- ***3000 KVA Fairbanks-Morse plant. 3—1000 KVA units with Westinghouse Generators.***
- ***1—1250 KVA Nelseco-General Electric Generator—300 RPM. Bosch solid fuel injection.***
- ***14—1250 KVA General Motors generator sets, Model 16-278A—complete with Electric Machinery Mfg. Co. Alternators. 60 cycle and 50 cycle.***
- ***18—1250 KVA Fairbanks-Morse, with Electric Machinery Mfg. Co. Alternators. 60 cycle and 50 cycle.***
- ***2—600 KVA Busch-Sulzer engines with G.E. Alternators.***

For smaller units advise us of your requirements.

ALL UNITS ARE AGSCO REMANUFACTURED AND GUARANTEED

Business Established 1898.

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D. E. M. A. SPONSORS ENGINEERING CONFERENCE

Left to Right, seated—J. P. Hyde, Chief Engineer, Ingersoll-Rand Company; Charles Fike, Chief Electrical Engineer, Cleveland Diesel Engine Division, General Motors Corp.; Roy A. Hundley, Chief Engineer, Enterprise Engine & Foundry Co.; L. B. Jackson, Director of Engineering, Diesel Division, American Locomotive Co. (Chairman of Meeting); Harvey T. Hill, Executive Director, Diesel Engine Manufacturers Association; Knute O. Keel, Chief Engineer, Cleveland Diesel Engine Division, General Motors Corporation; Ralph L. Boyer, Chief Engineer, Cooper-Bessemer Corp.; Robert P. Ramsey, Chief Engineer & Vice President, General Machinery Corporation. Left to Right, standing—George H. Amberg, DEMA Staff; George Steven, Executive Engineer, Worthington Pump & Machinery Corp.; E. F. McBride, Installation Engineer, The Baldwin Locomotive Works; Edward J. Harley, Executive Manager, Diesel Engineering Department, The Baldwin Locomotive Works; C. E. Cox, Chief Engineer, Chicago Pneumatic Tool Co.; Ervin L. Dahlund, Assistant to Director of Engineering, Fairbanks, Morse & Co.; John M. MacKendrick, Vice President in charge of Engineering, Clark Bros. Co., Inc.; Emil Greishaber, Chief Engineer, Nordberg Mfg. Co.; George J. Rathbun, President, The Rathbun-Jones Engineering Co.

Such topics as cooperation with national engineering societies, fuel oils, and crankcase explosions highlighted a meeting of engineers in the Diesel engine industry recently at Cleveland, Ohio. The session was held under the auspices of the Diesel Engine Manufacturers Association.

It was the second open-discussion meeting of its type to be arranged by the Association, the first having been held last December in Chicago. The Cleveland session was conducted during the one-week meeting of the American Society of Mechanical Engineers.

Next December will bring the engineers together again, according to E. J. Schwanhausser, President of Diesel Engine Manufacturers Association. Topics under consideration for the third session include piston scuffing, altitude ratings and metallurgical problems.

These cooperative meetings sponsored by the Diesel Engine Manufacturers Association should be of great help to the individual concerns and to the Diesel industry as a whole.

ENGINEERING SOCIETIES MEETINGS SCHEDULED

A.S.M.E. 1947 Meetings

Fall Meeting	Salt Lake City	September 1-4
I.I.R.D. 2nd National Conference	Chicago	September 8-9
Petroleum Mechanical Engineering 1947 Conference	Houston	October 6-8
Fuel and Coal Division 10th Joint Conference	Cincinnati	October 20-22
Annual Meeting	Atlantic City	December 1-5

S.A.E. National Meetings

West Coast Transportation & Maintenance	Los Angeles	August 21-22
Tractor Meeting	Milwaukee	September 17
Aeronautic Fall Meeting & Aircraft Engine Display	Los Angeles	October 2-4
Production Meeting	Cleveland	October 20-21
Fuels and Lubricants	Tulsa	November 6-7
Air Transport Engineering	Kansas City	December 1-3
Annual Meeting and Engineering Display	Detroit	January 12-16

Disney is Assistant General Sales Manager for Baldwin Locomotive

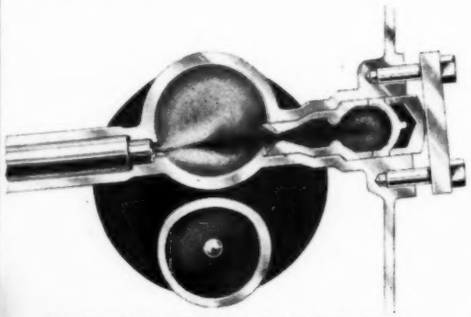
ROLAND C. DISNEY, formerly manager of eastern district sales of The Baldwin Locomotive Works, has been promoted to the position of assistant general sales manager, it was announced recently by R. Nevin Watt, general sales manager of the company.

Mr. Disney emerged from the army with the rank of lieutenant-colonel. He was graduat from Baltimore Polytechnic and attend Johns Hopkins University. He had been the engineering department of the Weste Electric Company for 11 years before bei called to active military duty in 1941. signed to the Philadelphia Ordnance Distri Lieut. Col. Disney served as chief of the ta and automotive division and assistant ch of the industrial division. Later he served the European theater with the latter divisi

POWER BY
Red Seal
Engines
CONTINENTAL

BUILT FOR THE JOB:

THERE ARE *five "Cushioned Power" Diesels in the Red Seal line, including four- and six-cylinder models, with displacements ranging from 157 to 572 cubic inches. Write for free engine bulletins.*



EXPLOSIVE SHOCK *is reduced in "Cushioned Power" combustion chamber of Red Seal Diesels. Increased turbulence promotes complete burning of fuel and results in smoother, cleaner operation. Absorption of peak pressure at instant of explosion levels out the power impulse over the whole piston stroke, for maximum power, and minimum stress on moving parts. Free booklet in full color gives details. Write for it.*

PROVED IN USE

For more than a year, Red Seal Diesels have been on the job in dozens of industrial applications. They have been more than living up to engineering forecasts, winning a reputation for smooth, clean operation, low operating cost, and minimum maintenance. You'll be money ahead if you specify Red Seal Diesels for jobs requiring 15 to 115 shaft horsepower.

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35 YEARS' SPECIALIZED EXPERIENCE BUILDING ENGINES FOR TRANSPORTATION, INDUSTRY, AVIATION AND THE FARM


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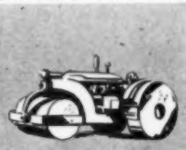

ROAD ROLLERS

Charles F. Kettering Retires

ANNOUNCEMENT of the retirement of Charles F. Kettering as Vice President in charge of the research laboratories and of John Thomas Smith as Vice President and general counsel was made recently by General Motors. Both of these executives have reached the normal retirement age.

Charles L. McCuen, Vice President in charge of the engineering staff, will become general manager of the Research Laboratories Division, succeeding Mr. Kettering. James M. Crawford, who has been general assistant to Mr. McCuen, was elected Vice President in charge of the engineering staff to succeed Mr. McCuen.

Mr. Kettering's close association with General Motors began in 1920 when the Dayton Research Laboratories, of which he was a co-founder, was acquired by the corporation. Mr. Kettering already had won widespread fame as an inventor, chiefly through his development of the Delco electric starting, lighting and ignition system, the Delco farm lighting system and the electric cash register. Mr. Kettering has directed the General Motors research organization in work on varied projects of far-reaching significance. Among its developments were the two-cycle Diesel engine, Tetra-ethyl lead, the basis for Ethyl gasoline, the new improved Freon refrigerant, a new fuel-saving high compression gasoline engine and numerous other parts and processes which have vastly improved transport. Mr. Kettering's work in the field of medical research is extensive though less well known.

Mr. McCuen began his General Motors career with the Olds Motor Works in Lansing, Mich., in 1926 after working with other automobile companies in his native state, California, and in Detroit. He served successively as chief engineer of Olds and director of engineering, technical assistant to the general manager of the Olds and Buick Divisions and general manager of the Olds Motor Works Division. Mr. McCuen was elected Vice President in charge of the engineering staff in 1940.

Mr. Crawford had gained wide experience in the automotive industry before joining the Chevrolet Motor Division of General Motors in 1927 as assistant chief engineer. Two years later Mr. Crawford became chief engineer of Chevrolet, a position he held until 1945, when he was made assistant to Mr. McCuen. Mr. Crawford was president of the Society of Automotive Engineers in 1944-45.

Wilson Named Elliott Co. District Manager

F. Q. Wilson, Jr.

F. Q. WILSON, JR., has been appointed Elliott Company Cincinnati district manager. Mr. Wilson, an electrical engineer graduate of Kansas University came with the Elliott Company in 1938. He was sent as a field engineer to the Kansas City office in 1940, moved on to the Tulsa sub-district office in 1942, became sub-office manager in 1945 and a full district office manager in 1946.

A Report by C.E.D. on Problems of Small Business

A PROGRAM designed to strengthen small business in its management, in its finance and with respect to taxation, and to improve competitive opportunity is contained in a statement on national policy recently made public by the Committee for Economic Development. The statement, which follows two years of study by the CED Research and Policy Committee, was made public by Paul G. Hoffman and Raymond Rubicam. Hoffman is president of the Studebaker Corporation and CED chairman, while Rubicam is chairman of the Research and Policy Committee.

The statement declares that the number one problem of small business is management, and that more failures are due to lack of skill in running the enterprise than to any other single cause. The committee makes several recommendations to solve this problem.

In the field of financing, the statement points out that the biggest problem of small business is long term credit and equity capital.

On the subject of taxes the committee favors reforms in those present provisions of the taxing system which are harmful to all business

but which, in its opinion, bear on small business with special severity. The committee does not advocate creating tax privileges in favor of small business as a class, but points out that the need of all business is for risk capital and that the soundest sources for such capital are individual savings and the plowing back of earnings into the business.

Finally it offers as one of its major recommendations that the existing federal legislation relating to competition and business practices, such as the Sherman Anti-Trust Act, Miller-Tydings Amendment, Clayton Act, Federal Trade Commission Act, Robinson-Patman Act, etc., be reexamined and recast to clarify objectives and insure consistency in the application of reasonable principles and methods to further these objectives.

The statement points out that 98 per cent of all business firms in America are small. It notes that of 3,317,000 business units in this country in 1939, when the last U. S. census of business was taken, 1,503,000 had no employees, 1,221,000 had one to three, 305,000 had four to seven, 166,000 had eight to 19 and 70,000 had 20 to 49. There were but 52,000 firms with 50 or more employees.

Requests for the full text of the statement should be addressed to the Committee for Economic Development, 285 Madison Avenue, New York 17, N. Y.; please mention DIESEL PROGRESS.

Sales Trip Develops New Business for Engine Mfrs.

NEW, active markets for internal combustion engine manufacturers were reported recently by William J. Williams, president of Synchro-Start Products, Inc. Using a unique "sales" method, Mr. Williams opened up these new sales fields, because he found himself acting more as a "missionary" for engine manufacturers than as a salesman for his own products.

Mr. Williams has recently returned from an extensive tour of the Eastern manufacturing territories, particularly in the New York area. His talks with a wide variety of users convinced him that an important change is occurring among all types of buyers. "I found a strongly increased interest in automatic gas, gasoline, and Diesel stand-by engine-generators," said Mr. Williams. "This is very good news for the manufacturers, and indicates that the economies and safety measures of their products are more widely recognized than is generally thought."

Sheppard Diesels Expand West Coast Service Facilities

EXPANDED west coast distribution and service facilities for Sheppard Diesels have recently been announced by Fred D. Livingston, Sales Manager of the R. H. Sheppard Company, Inc.

On May 1st, a factory branch office was opened at the foot of Hyde Street in San Francisco. It is located in the same building occupied by Oswald Machinery—who will continue to operate independently as a Sheppard dealer. The new office will be in charge of Mr. Emil Riutta, Sheppard factory representative.

Nordberg Opens Dallas Office

A NEW district office for Nordberg Mfg. Co. has been opened in the Cotton Exchange Building, Dallas, Texas. This office will be headquarters for Charles Trimble, District Manager and Jos. T. Adams, Sales Engineer.

Worthington, Ford Get New Posts with Koppers Piston Ring Division

APPOINTMENT of John A. Worthington as General Sales Manager of the Piston Ring Division of Koppers Company, Inc., was recently announced by Allen W. Morton, Vice President and General Manager of the Division.

At the same time, Mr. Morton announced that T. Latimer Ford, who has been with Koppers or its affiliates since 1908, and has become widely known in the piston ring field, will head up a new company department devoted exclusively to replacement sales.

In announcing the appointments, Mr. Morton said:

"In his new position, Mr. Worthington will assume responsibility for unifying and directing all sales activities of the Division, looking forward to increasing service to customers and ultimate expansion of the Division's scope of operations.

Mr. Worthington is a native of Annapolis, Md., and joined the Bartlett Hayward Company, now a division of Koppers, in 1916, after attending St. Johns College and Johns Hopkins University night school.

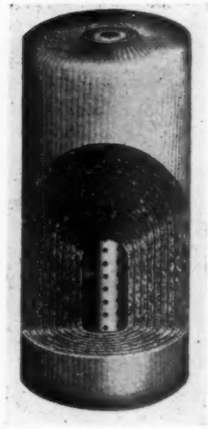
At Bartlett Hayward he started as an inspector and in three years became a foreman. In 1920 he was transferred to the American Hammered Piston Ring Division as assistant shop superintendent. Two years later he became an engineer in that Division and since 1925 has been manager of industrial sales and engineering. He is a member of the American Society of Mechanical Engineers, the American Society of Naval Engineers, and the Naval Architects & Marine Engineers Society.

Mr. Ford joined the Bartlett Hayward Company in 1908 and in 1919 became assistant secretary and treasurer of the American Hammered Piston Ring Company. In 1921 he was made Pacific Coast district sales manager of the company, and in 1927 became Vice President and sales manager.

When American Hammered was consolidated with Koppers in 1936, the position of Vice President was abolished and Mr. Ford became sales manager of the company's automotive division.

He is a native of Baltimore and was educated at Baltimore City College.

New Oil Filter Element



Engine Life filter element.

BUILT for application in all types of lubricating systems is the new Engine-Life Oil Filter Element manufactured by Engine Life Products Corporation. These replacement filters consist of lint-free textiles wrapped in a closely knit muslin, pressure wound in convolutions around a perforated metal core and covered with a heavy tubing or muslin jacket. The horizontal flow of oil from outside to inside through the laminated construction materially increases dirt and sludge removal.

These filters may be used with any type of oil regardless of its use or application. Replacement elements are available in 260 different sizes to fit all popular makes of filter cases. No adapters, springs, spacers or liners are necessary to make them fit.

For further information write Engine-Life Products Corporation, El Monte, California.

25 New Diesel-electrics for Santa Fe Railway

ORDERS for 25 new Diesel-electric locomotives are being placed by the Santa Fe Railway with four of the leading locomotive builders according to announcement made recently by Fred G. Gurley, president of the railway. Eight 6000 horsepower passenger locomotives will be built by Electro-Motive division of General Motors Corporation at LaGrange, Illinois; four 4000 horsepower passenger locomotives and four 1000 horsepower switching locomotives will be built by American Locomotive Company, Schenectady, N. Y.; six 1000 horsepower switching locomotives and one 2000 horsepower transfer locomotive will be built by Baldwin Locomotive Works, Eddystone, Pa.; and two 1000 horsepower switching locomotives will be built by Fairbanks Morse & Co., at Beloit, Wis.

When these locomotives are added to the Santa Fe fleet the total horsepower will be 748,760 divided as follows: 48 passenger locomotives 228,800 horsepower; 73 freight locomotives, 374,600 horsepower, and 156 switching locomotives, 145,360 horsepower.

Caterpillar Announces Promotions

J. M. Davies *R. C. Williams*

DR. G. A. ROSEN, Director of Research of Caterpillar Tractor Co., announced recently the promotion of J. M. Davies as Associate Director of Research in administrative charge of the department and R. C. Williams as Assistant Director of Research in charge of tractor and earthmoving projects.

Mr. Davies joined the engineering department of "Caterpillar" in October 1925 as a member of the engineering laboratory at the San Leandro, California plant. In 1933, Mr. Davies came to Peoria and organized the laboratory of the engineering department at this plant. When the research department was formed in 1942, he became assistant director of the department.

A University of Illinois graduate in mechanical engineering, Mr. Williams joined the company in November 1932 as an engineering trainee. Upon completion of the course two years later, he became a member of the engineering laboratory and later served as a field engineer. In 1944, Mr. Williams worked as a project engineer before assuming duties as a staff engineer in 1945.

The present Assistant Directors of Research, L. A. Blanc, W. L. H. Doyle, C. R. Maxwell and C. R. Schad have been assigned additional duties in step with the expanding post-war necessity for advanced and efficient machinery.

100 MPH Diesels for British Railway

AN important change in transportation practice in Great Britain is forecast by the announced decision of the L.M.S. Railway to introduce Diesel-electric locomotives, capable of 100 m.p. on main line London-Glasgow services during 1948. This announcement suggests that no great progress will be made on the program of conversion to oil and that Diesel electric types will be used instead of oil burning locomotives by British railways.

The Diesel-electric locomotives to be introduced by the L.M.S. will be of 3,200 hp., composed of two 1,600 hp. units coupled together and will be capable of hauling the heaviest trains between London and Glasgow or alternative fast trains between these cities.

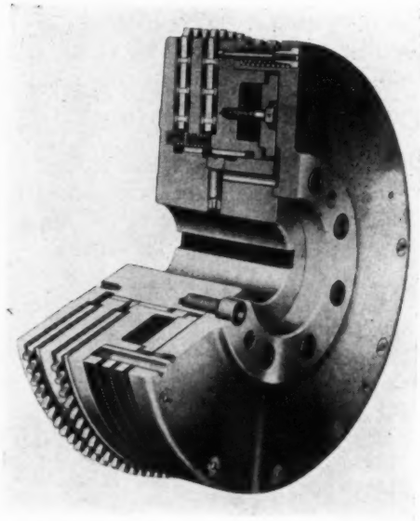
This new locomotive will work services comparable with the pre-war Coronation Scot, which was normally hauled by the company's most powerful 4-6-2 steam locomotive.

The first of these new types of locomotives will be put on in competition with the 4-6-2 now in use between London and Glasgow.

A second experiment on Diesel-electric locomotives is the use for separate work of each of the two units which make up the express passenger loco. Suburban and semi-fast passenger trains and medium weight, main-freight services, will use these 1,600 hp. locomotives.

An 800 hp. Diesel-electric locomotive is another experiment, which is suitable for branch and cross-country passenger and freight services, capable of speeds of 60 mph. with light passenger trains.

Air Actuated Clutch



Cutaway view of Twin Disc Model P. Air Actuated Clutch

A NEW air-actuated clutch, the Model PH, has been designed and is now being built by the Twin Disc Clutch Company of Racine, Wisconsin. This clutch is available in 30", 36" and 42" sizes. The new Model PH Clutch supplements the regular line of Twin Disc Model P Air-actuated Clutches and widens the range for selection of a unit to fit any need. Sizes of the two models of air-operated clutches now run from 14 to 42 inches with capacities from 75 hp. to 1325 hp. Torque ratings range from 900 foot-pounds to 89,550 foot-pounds. These new torque ratings have been obtained by modifying the basic Twin Disc Air-operated Clutch design to permit increased air cylinder areas, thus making the Model PH Clutches especially suitable for application in the petroleum industry and for heavy-duty construction equipment.

New Diesel Oil Announced by Gulf

A NEW automotive Diesel lubricating oil is one of four new Gulfpride oils. Each of these new oils is made especially to give greater service in different kinds of internal combustion engines. In addition to the new Gulfpride Diesel, the company will market Gulfpride Motor Oil, Gulfpride Marine Oil and Gulfpride Aviation oil.

Gulfpride Diesel is a fully detergent oil, refined from the highest quality paraffinic crude by the most modern solvent processes and then super-refined by Gulf's exclusive Alchlor process. It contains detergent-dispersant compounds and other additives which were selected after lengthy tests under severe laboratory and field operating conditions. Gulfpride Diesel is offered in five S.A.E. viscosity grades, 10 to 50 inclusive, to provide a proper oil for every automotive Diesel engine under all temperature conditions.

Power Plants Order Large Diesels

A CASUAL "How's business?" just as this issue goes to press brought some interesting news of recent engine orders placed through the New York office of Nordberg Manufacturing Company.

The City of Freeport, Long Island will add to its plant a 3850 hp. Nordberg Diesel with a 2715 kw. Westinghouse generator.

Maine Public Service Company of Presque Isle, Maine has ordered a 3600 hp. Nordberg Diesel with a 2550 kw. Elliott generator for its Caribou, Maine plant in addition to a 1425 hp. Nordberg Diesel and 1000 kw. General Electric generator, previously ordered.

New Bristol Catalog on Time Cycle Controllers

THE Bristol Company has recently published a 12-page bulletin, No. C305, on its new line of Model C500 Impulse-Sequence Time Cycle Controllers. The bulletin gives detailed information about the newly developed Model C500 Cycle Controller for tire presses, plastic molds and general process operations. The booklet is liberally illustrated with line drawings to show principle of operation and method of use on typical plant processes.

A copy of this new catalog may be obtained upon request. Write the Bristol Co., Sales Promotion Dept., Waterbury 91, Conn.

SAVINGS FOR THE SARATOGA LINE

THE Saratoga & Schuylerville Railroad, with 32 miles of track serving Saratoga, Schuylerville, and Mechanicville in upstate New York, estimates that it will save $15,000 annually with its new Alco-GE 70-ton Diesel-electric locomotive now in operation. The locomotive should pay for itself in four years, according to S. M. Pinsly, president of the railroad.

"We could have saved $20,000 in the first year if we had had this Diesel-electric locomotive when we started operating the road in January, 1946," stated Mr. Pinsly. "From the past five months operation of the 70-tonner, we know that it is the solution to many of our previous operational headaches."

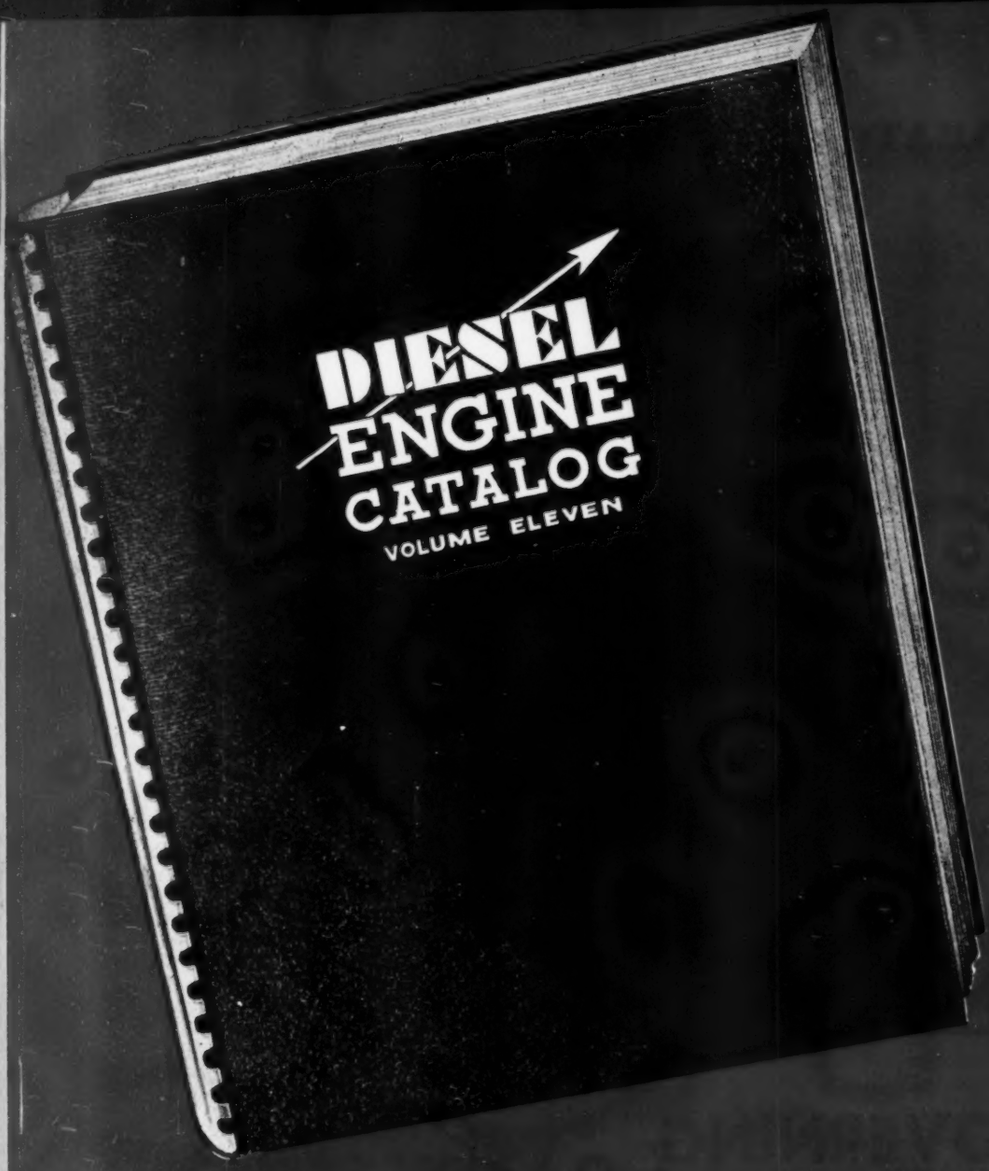
Purchased a year ago from the Boston & Maine Railroad, the Saratoga & Schuylerville is a vital link between that line and the upstate New York area, hauling coal, molding sand, paper, grain, wall paper, and other industrial products. Handling 2300 freight cars of all types in 1946, the line expects to increase this number to 3000 in 1947. Car tonnage will show a 60 per cent increase over 1946. Based on present operations, the 70-ton Diesel-electric will operate 20,000 miles this year.

70-ton Alco-GE Diesel Locomotive on Saratoga line.

Replacing a 70-ton 2-6-0 steam locomotive the new 600-hp., 70-ton Diesel-electric has shown a weekly savings of over $105 in fuel costs, based on a six operating week, ten hours a day. Approximately $250 a month is saved by the elimination of hostler services. The Diesel-electric requires refueling only every four or five days, whereas the steamer had to be serviced every day.

Maintenance on the new 70-tonner as compared to the steam locomotive is considerably less. The Diesel-electric is serviced every two weeks, on Sundays, at a cost of approximately $75 a month, and thus does not interfere with weekday availability. All maintenance is done in the Saratoga & Schuylerville Railroad's new shop. With the former steamer, considerable maintenance expense was incurred in that the locomotive had to be sent to the Boston & Maine shops for repairs.

The new 70-ton locomotive's lighter weight and distribution of axle loading make road maintenance easier on the Saratoga & Schuylerville's 75-lb. rail and allows greater safety margin where bridge loading is limited to 75 tons. With the steepest grade on the line approximately 2½ per cent, this locomotive has made the haul with 525 tons. Operating in either direction, the Diesel-electric eliminates turnabouts, resulting in considerable time saving.



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THE WHOLE DIESEL INDUSTRY UNDE ONE COVER

Whether you are looking for the smallest Diesel engi or the largest, you will find it described and illustra in the DIESEL ENGINE CATALOG, Volume II, edit by Rex W. Wadman. What's more, you will find co plete specifications on

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Miniature Hydraulic Control

New Sperry Products Control..

A NEW miniature hydraulic remote control, developed and manufactured by Sperry Products, Inc., establishes a new record in the lightweight class. The new control has a torque capacity of 50 lb.-in. on the pressure stroke and is rated as much as 50 percent more powerful than the earlier and slightly heavier Sperry model. Although the new Sperry product has numerous applications, its general uses cover throttle, mixture, governor, valve, and position indicator control.

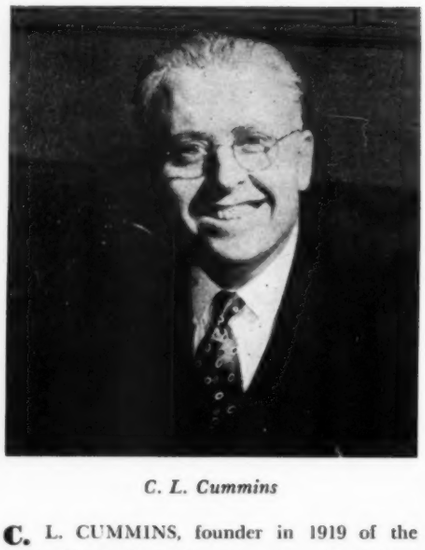
Like the larger Sperry controls, the miniature version consists of two units, a transmitter and a receiver, which form a self-contained, completely enclosed, hydraulic system when joined together by a single line of tubing and filled with oil. Only two small bolts are required to mount each unit in place. Copper tubing or flexible hose, which may be run through or around obstructions or bulkheads, makes it possible to install units in any location and to obtain remote control at distances up to 35 feet. For further information write Sperry Products Inc., 15th St. and Willow Ave., Hoboken, N. J.

Great Northern Orders More Diesels

PURCHASE of new motive power and freight equipment costing more than 9 million dollars was authorized recently by Great Northern Railway directors following the company's annual stockholders' meeting here.

Mr. Gavin said that the new equipment will include nine 4,500-horsepower Diesel locomotives for freight and passenger service, 500 boxcars and 400 refrigerator cars.

C. L. Cummins Elected Chairman of Cummins Board



C. L. Cummins

C. L. CUMMINS, founder in 1919 of the Cummins Engine Company, Inc., Columbus, Ind., was elected Chairman of the Board of Directors, and J. I. Miller was elected President of the company, at the 1947 annual meeting of stockholders and directors.

Mr. Cummins founded the firm in February, 1919 to build what was then called "the Cummins Oil Engine." At the time of its founding, the firm employed fewer than 20 persons whereas now there are over 2000.

Stockholders and directors of the company adopted resolutions at the meeting expressing their appreciation for the services Mr. Cummins has rendered the company.

Mr. Miller came to the company in 1934 in the capacity of Vice-president and General Manager and has been with the company continuously since that time except for the years 1942-44, when he served as a commissioned officer in the U. S. Navy aboard the USS Langley.

Other officers elected by the board are: V. E. McMullen, executive vice-president; R. E. Huthsteiner, vice-president and general manager; H. L. Knudsen, vice-president of engineering; Carl R. Fox, vice-president and works manager; D. C. Bottorf, secretary and treasurer; R. E. Lay, assistant secretary and assistant treasurer, and Edwin G. Crouch, assistant secretary.

New Whitcomb Locomotive Bulletins

THE Whitcomb Locomotive Company recently issued a new set of descriptive bulletins covering their industrial and railroad locomotives. The industrial type locomotives range from 3 tons up to 30 tons and in hp. from 27.5 to 190. They are all Diesel with Hercules, Caterpillar and International Harvester engines installed. The Whitcomb Locomotives designed for railroad service range from 25 to 80 tons and are all equipped with Diesel-electric drive. Hercules, Caterpillar and Sterling Viking engines are utilized. Westinghouse motors and generators are supplied. The bulletins are in looseleaf form and are assembled in an attractive folder. Write the Whitcomb Locomotive Company, Rochelle, Illinois, for your set.

New Low Cost Induction Heating Unit

750 watt TOCCOtron brazing bellows assemblies.

THE TOCCO Division of The Ohio Crankshaft Company, Cleveland, Ohio, has announced a new addition to its line of induction heating machines. The newest is a 750 watt 450,000 cycle TOCCOtron—a bench type machine designed primarily for silver brazing and soldering, but also adaptable to hardening, annealing and forging applications within its power capacity.

The new low-cost unit is of the tube oscillator type. It operates from a 110/120 volt A.C. single phase 60 cycle current source and is tapped to accommodate either single or multiple-turn inductor coils. A revolutionary feature is the fact that the new unit requires no water connections.

This small TOCCOtron unit is suitable for both automatic or manual operation. It is designed to operate continually at full load for mass production work yet is readily adaptable to quick set-up changes required by job-shop or tool room operations. Inductor coils can readily be made by simply forming copper tubing or wire to the required shape.

For further information write The Ohio Crankshaft Company, 3800 Harvard Ave., Cleveland, Ohio.

AC Generators

. . . . *Continued from page 40* . . . .

a minimum reading and starts to increase. It may be necessary to modify excitation on other units to hold voltage at the proper value. At the minimum a-c amperes, the unit is operating at unity power factor and load is:

$$\text{(c) kw.} = \frac{\text{volts} \times \text{minimum amperes} \times 1.73}{1000} \quad \text{(3 phase)}$$

$$\text{(d) kw.} = \frac{\text{volts} \times \text{minimum amperes}}{1000} \quad \text{(1 phase)}$$

8. The output kva. at previous excitation was:

$$\text{(e) kva.} = \frac{\text{volts} \times \text{normal load amperes} \times 1.73}{1000} \quad \text{(3 phase)}$$

$$\text{(f) kva.} = \frac{\text{volts} \times \text{normal load amperes}}{1000} \quad \text{(1 phase)}$$

9. Power factor equals:

$$\text{(g) Power factor} = \frac{\text{kw.}}{\text{kva.}} = \frac{\text{minimum a-c amperes}}{\text{normal load a-c amperes}}$$

10. Power factor may be either lagging or leading. Usually it is lagging. This can be checked by decrease in excitation, as a decrease in excitation accompanied by a decrease in line amperes indicated unit was operating normally, that is, lagging.

11. A rough check on proper operation of cross current compensation is to cut out all series field rheostat resistance and then measure the exciter voltage. On normal machines with 125 volt field winding, approximately the following voltages should be obtained when operating in parallel:

No load, normal line voltage—55 volts on exciter
Full load, unity power factor—80 volts on exciter
Full load, 80% power factor—110 volts on exciter

If exciter voltage on any one machine, with kilowatt load divided proportionately, is not consistent with other units the cross current compensation adjustment should be checked.

Mack Appoints Rowold

THE appointment of Henry Rowold as Assistant General Sales Manager of Mack-International Motor Truck Corporation was recently announced by A. C. Fetzer, Vice President and General Sales Manager. Mr. Rowold, also a Vice President of the company, combines his new duties with those of National Accounts Manager, a position he has held for some time.

Diesel Iron Horse Gaining on Steam Model

THE switch by major United States railroads from steam to Diesel is proceeding at a rate that indicates oil-fueled locomotives will outnumber steam engines even before the full possibilities of turbine engines can be realized, according to the current issue of The Lamp, publication of Standard Oil Company (New Jersey).

This trend is evidenced, The Lamp says, by the fact that major roads are now ordering seven times more new Diesel engines than steam, while more than 75 per cent of the steam locomotives now in service are more than 22 years old.

Recently, ten Class I roads (those having annual operating income of more than one million dollars) asked General Motors, the largest builder of railroad Diesels, to cooperate in studies of 100 per cent Dieselization of their roads, The Lamp says. The Southern Railway, in mileage the third largest east of the Mississippi, hasn't bought a steam engine since 1928, The Lamp adds, and, so far as can be told, is unlikely to do so in the future.

On the basis of the Interstate Commerce Commission's summary of fuel consumption and engine performance on Class I railroads for the first six months of 1946, it is calculated that Diesels reduced fuel costs 45 per cent in passenger service, 56 per cent in freight service and more than 75 per cent in switching operations as compared with coal-burning steam power.

It might be expected, The Lamp adds, that veteran railroad men who grew up with the dramatic, beloved steam engine would take a dim view of Diesels. However, the old timers on the Southern Railway have largely taken just the opposite attitude. They appreciate the greater efficiency, comfort, and cleanliness of the Diesel, and their appreciation is summed up in phrases such as "If I'd been in Diesels all my life I'd be ten years younger."

Consolidated Moves to City Island

THE Consolidated Shipbuilding Corporation, for many years a landmark on the Harlem River, has moved to its new location at City Island, Bronx, New York, Mr. William G. Wood, President, announced today.

The company was established on the Harlem River at the foot of 177th Street in 1887 and has served the United States Government through three wars in the construction of naval craft. In World War II it produced 142 vessels for the Army and Navy and since V-J Day has reconverted to its former position as the leading builder of custom yachts on the East Coast.

Mr. Wood stated that he has anticipated the move to City Island on Long Island Sound for several years and that he feels a location on the Fifth Avenue of Yachting, and especially within the boundaries of New York City, is a distinct convenience to yacht owners.

Roots-Connersville Bulletin

A NEW bulletin recently issued by the Roots-Connersville Blower Corp. covers various types of equipment for use in sewage disposal plants and water works. Diversity of driving arrangements are also covered. These R-C blowers can be driven by any type of standard drive that best suits the customer's requirements. Direct coupled gas engines, operating on sludge gas, economically utilize cheap by-product fuel. Bulletin 23-120-B10 is available on request to Roots-Connersville Blower Corporation, 900 West Mount St., Connersville, Indiana.

Diesels for Russian Logging Industry

IN an effort to mechanize the logging industry in Soviet Russia and thus increase lumber output to 10 billion cubic feet in 1950 the government has begun a program which will see construction of 1,420 Diesel locomotives, 12,000 tractors, 14,000 motor trucks and 25,000 flatcars. This equipment along with the construction of 600 motor roads and 220 narrow gauge railroads totalling 11,000 miles will result in the 70% mechanization of Russia's timber hauling.

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★ To Permit Long Term Maintenance Economy

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Adaptable as standard equipment or as replacement units, operating in any position or under rigorous space, weight, speed or load conditions. Available in eleven standard sizes machined to your order or supplied for your stock to be fitted as required.

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The Durabla arched construction metal valves are in service at pressures as high as 5000 pounds per square inch. Protective alloys permit operation at temperatures ranging from 800° F to extreme sub-zero conditions and give protection against corrosive fluids or gases, and suspended abrasive substances.

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The light weight valve permits light spring loading, less power to open valves, no lag in valve opening and closing; slower speed operation at full capacity. The valve guard permits controlled lift, insuring minimum of slip, cavitation, or turbulence. The central valve stem insures no impedance to flow around the entire valve member. Freely mounted valve member can tip to adjust to natural flow lines.

4. Will Last Longer

The freely mounted valve member permits self grinding action and accommodation to wear on the valve seat. Valve spring is self cleaning and protected against wear due to touching of the coils. There are no wing guides or high hubs to cause friction, binding or stem breakage due to side pressure, no rubber to deteriorate or pick up suspended matter; a minimum stock is needed to fit all requirements; installation is simple and requires minimum shut-down time.

A pump valve seldom attracts attention until there is something wrong with it and when it causes trouble it causes serious trouble, expense or delay. The unique characteristics of DURABLA VALVES, summarized above, and illustrated in diverse applications in our DURABLA CATALOG 920, will give you effective and versatile insurance against pump failure.

Address DURABLA Engineering Department for Information and Bulletin: Reference 7P7

*Patent Numbers 2090486, 2117504

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Stahn Joins Young Radiator Co.

J. A. Stahn

YOUNG Radiator Company, Racine, Wisconsin, manufacturer of heat transfer equipment, recently announced the addition to its staff of James A. Stahn as Engineering Representative.

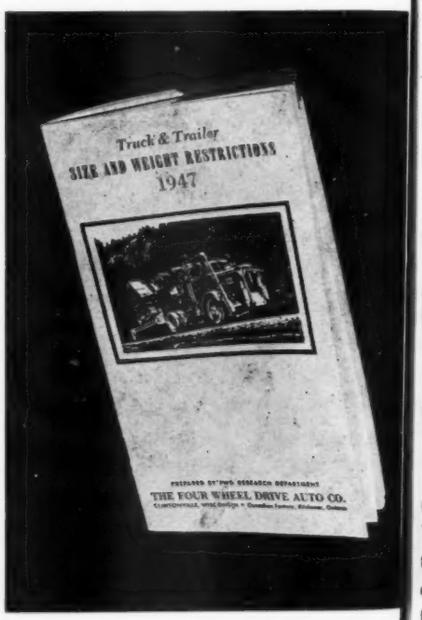
Mr. Stahn will be connected in a Sales Engineering capacity particularly for Aircraft Heat Transfer Products. Mr. Stahn comes to Young Radiator Company with a wide and varied background of experience in the heat transfer field. Graduated from Purdue University in 1941 with the degree of B.S.M.E., he entered the Army Air Forces in September of 1941. Under the AAF training program his formal education was continued at the University of California where he received his Master's Degree in Mechanical Engineering in 1946.

Improved Rodpak Announced

AN improved floating seal metallic packing is announced by Rodpak Manufacturing Company. Speedy and foolproof to install, it eliminates leakage without reducing the characteristic Rodpak flexibility. The new packing is adapted to both rod and plunger type operations and is useful for all types of compressors; steam units; hydraulic units; oil, acid or water pumps, hot or cold, marine units such as feed pumps, service, transfer, fire and bilge pumps and brine pumps; refrigeration units.

Improved Rodpak will hold even higher pressures than would the original type; for example, the original Rodpak would have required three segments to hold 1500 lbs. hydraulic pressure, but the improved type can do the work with only one unit. Each unit consists of two metal rings and a new type synthetic ring. For full particulars write Rodpak Manufacturing Company, 1315 Natoma Street, San Francisco, California.

FWD Again Issues Truck & Trailer Size & Weight Restrictions Booklet



A COMPREHENSIVE study of the road laws regulating trucks and trailers throughout the United States has been completed by the Research Department of The Four Wheel Drive Auto Company, and has been compiled in a booklet form. The booklet is the eighteenth edition of the size and weight restrictions to be published by the company since 1933. Publication was suspended during the war when blanket regulations were enacted by the federal government in order to facilitate the movement of war materials, superseding state regulations in most cases.

Copies of the 1947 Truck & Trailer Size & Weight Restrictions may be obtained free by writing to the Advertising Department of The Four Wheel Drive Auto Company or to this magazine.

New Literature on International Diesel Engines and Power Units

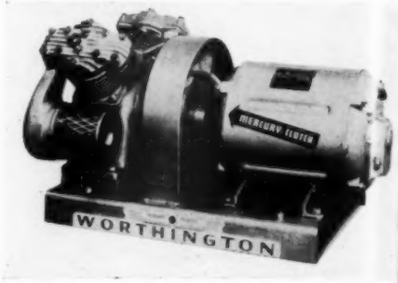
TWO new eight-page Diesel engine pamphlets are being distributed by the Industrial Power Division of the International Harvester Company. They give complete specifications for the UD-14A and UD-18A Diesel engines and power units recently placed in production by International. Bearing areas, moments of inertia, material specifications, and dimensions are but a few of the facts listed.

The UD-14A is the new 4¾ x 6½ four-cylinder Diesel rated at 76 hp. as a power unit when operating at 1400 rpm. The UD-18A is the new 4¾ x 6½ six-cylinder Diesel rated at 125 hp. as a power unit operating at 1600 rpm.

To obtain a copy of this literature, request form A-95-KK for the UD-18A Diesel and form A-96-KK for the UD-14A Diesel from the International Harvester Company, 180 North Michigan Avenue, Chicago 1, Illinois.

Air Force Day 1 August 1947

Mercury Actuated Clutch for Compressor



Worthington Air King Compressor fitted with Mercury clutch.

A MERCURY-ACTUATED clutch developed by Mercury Clutch Corporation of Canton, Ohio, makes possible automatic starting of air compressors. The clutch permits the driving motor to attain full speed before the compressor turns, eliminating the need for pressure release valves. This automatic clutch incorporates a "time delay" factor which retards the engagement for a second or more, long enough to permit the motor to come up to full speed before any load is applied. The motor is then able to bring to bear its greatest torque plus the inertia of its rotor to start the load. Motor current is greatly reduced and the starting windings are protected. Mercury (Quicksilver) is used as the control medium because of its high specific gravity. Centrifugal force acting on a small amount of mercury produces hydraulic pressure which is dependent upon the "head" of mercury rather than the amount. This pressure is utilized without the use of levers or other mechanical means, to cause the engagement of the friction elements of the clutch. The manufacturer has developed standard clutches for all types of electric motors up to 15 hp. and for internal combustion engines. For more information write The Mercury Clutch Corporation, Canton 6, Ohio.

White Engineering Issue New Folder Describing New Vapor Steam Cleaning Machine

WHITE Engineering & Mfg. Co., Inc., manufacturers of portable vapor steam cleaning machines, has just issued a folder describing their new Model No. 46B White Vapor Steam Cleaner. The folder describes the features and operation of the new White Vapor Steam Cleaner, which is intended for cleaning trucks, busses, automobiles, road and construction machinery, railroad, marine and general industrial equipment. Write the White Engineering and Mfg. Co., Inc., 154 W. Passaic St., Rochelle Park, N. J.

WEST COAST DIESEL NEWS

by FRED M. BURT

THE new 110-ft. tug *Okanogan,* to handle large traffic on Lake Okanogan, British Columbia, built for Canadian Pacific Ry., by West Coast Shipbuilders, Ltd., Vancouver, is powered with an 8-cyl., Washington Diesel, of 800 hp. and 257 rpm.

CANNERY tender *Pansy,* Pacific American Fisheries, is having a new 125 hp. Lorimer Diesel installed. Their fishing boat *Fleet* is getting a similar new power plant and a 100 hp. Lorimer is going in the seineboat *Cypress* under construction at Sagstads.

HARBOR Tug and Barge Company's tugboat *Alameda,* recently commissioned, now in service on San Francisco Bay, was outfitted by Pacific Drydock & Repair Co., with a General Motors twin Diesel on each of their twin screws. It is unusual for a 55-ft. tugboat to be powered with 600 hp. Diesels.

FAIRBANKS, Morse & Co., with headquarters at 2401 Santa Fe Ave., Los Angeles, has just completed a 100′ x 200′ addition in Pomona to complete a 90,000 sq. ft. mechanized foundry. Also a 19,000 sq. ft. assembly building is being added for increased production of deep-well turbine pumps.

THE 61-ft. halibut boat *Sanak,* Capt. S. O. Hegge, Seattle, has a new power plant, supplied by Western Tractor & Equipment Co., Seattle; a 115-hp. "Caterpillar" Diesel Marine engine, with 2 to 1 Western Marine Gear to drive a 44″ x 32″ propeller at 450 rpm.

THE *Voyager* 112-ft. tuna clipper to fish for Van Camp Harbor Packing Co., San Diego, built in Tacoma by Pacific Boat Building Co. for owners John and Frank Souza, John Mladinich, is propelled by a 550 hp. Washington Diesel; auxiliaries are three 95 hp. direct-connected General Motors Diesels.

THE 116-ft. *Anthony M,* world's largest purse seiner was recently launched by the Master Builders in Alameda; powered with a 700 hp. Washington Diesel; to power two 125 kva. generators are two 120 hp. Washington Diesels.

POWERED with a 675 hp. Cooper-Bessemer Diesel set low between two 118 hp. Cooper-Bessemer Diesel auxiliaries each driving 80 kw. A.C. generators, is the 112-ft. clipper *West Point;* first steel vessel built by Tacoma Boat Bldg. Co. Home port will be in San Diego.

Evans Engine and Equipment Co. Installations

BUILT by Art Jacobson for Peter Rorvik, Seattle, in 1946, 48-ft. troller *Helen L II,* has had its one year old gasoline engine replaced by a General Motors 165 hp. at 1850 rpm., Marine Diesel; turning 40″ x 23″ Olympic propeller through 3:1 reverse and reduction gear.

A NEW General Motors Diesel has replaced an old Diesel engine in 57.4″ yawl *Maruffa;* supplied by Evans Engine & Equipment Co. for owner John Graham, Jr., architect and engineer; it drives through 2:1 reduction V-belt drive to "N. & S." 25″ x 25″ reversible propeller.

THE *New Sunrise,* 57-ft. seiner, built by Grandy Boat Co. in 1945 for Gordon Nelson, Cordova, Alaska, has had its two-year old gas engine replaced by a General Motors Marine Diesel, 165 hp. Engine has front PTO, 900 watt, 32 volt generator.

ADVERTISERS' INDEX